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A. C. TRUE, DIRECTOR

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.

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EXPERIMENT STATION RECORD.

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Hon. Joseph H. Brigham, whose death occurred suddenly June 29, was the third person to occupy the position of Assistant Secretary of this Department since it was raised to the first rank. In point of service his term was longer than that of either of his predecessors, extending over seven years, which marked a period of the greatest development in the history of the Department.

Colonel Brigham had been for many years a National figure in agriculture, and prominently identified with many of the more important movements for agricultural advancement. He early attained prominence in the Grange, being twice elected to the position of master of the Ohio State Grange, and he served for nine years as master of the National Grange. The latter office gave him a position of wide influence and made him the representative of that great organization in the agricultural matters of the day.

His connection with the experiment station movement, and especially with the Ohio Station, was one of which he was justly proud. During his term in the State senate in 1882 he introduced and secured the passage of an act establishing a State experiment station, and appropriating $3,000 a year for its maintenance. From the first he was quite closely identified with the organization and development of that station, for he was called upon by the governor to suggest the members of the board of control, and as the founder of the station his counsel was sought on important points. At that time there were barely a half dozen stations in existence in the whole country, and there were few people who appreciated the value of an experiment station or realized what it should be.

Upon the reorganization of the station under the Hatch Act in 1888 he was appointed a member of the board of control, which position he held until 1895. It was partly through his efforts that funds were secured for moving the station to its present location, and he lent his aid in obtaining from the State the liberal appropriations for maintenance and for buildings which have enabled it to grow to its present proportions.

It was during Colonel Brigham's incumbency as master of the National Grange that that organization became a strong advocate of the experiment stations, and threw the weight of its influence in support of the Hatch Act, then pending in Congress. On that occasion he headed a legislative committee of the National Grange which was in constant consultation and cooperation with an agricultural college committee, whose efforts were being directed toward the passage of the experiment station bill. The two things which Colonel Brigham's committee stood for especially were the guarding of the expenditures for original investigation and the State control of the details of the work.

A few years later, when the second Morrill Act was under consideration, he again appeared as chairman of a legislative committee of the Grange to promote the interests of agricultural instruction. His committee at first contended that the new appropriation should be assigned entirely to instruction in agriculture, and for a time withheld its support of the measure in maintaining this contention. Later a compromise was effected in the wording of the bill, and the clause restricting the application of the money to instruction in agriculture and the mechanic arts was written in a conference with Colonel Brigham and his committee, which brought the support of the National Grange.

Throughout his life he remained a stanch friend and supporter of the experiment stations of the country, in the making of which he had played a no small part; and their success and advancement to a position of great national importance was a source of pride and gratification to him.

Colonel Brigham was born December 12, 1838, and hence was in his sixty-sixth year at the time of his death. His military title was won in service during the civil war, for which he enlisted in 1861. He served throughout the war and was mustered out of service as colonel of the Sixty-ninth Ohio Volunteer Infantry. After the war he settled in Fulton County, Ohio, where he engaged in farming. He held various offices under the people of his State and county, serving three terms as sheriff of Fulton County, one term in the State senate, for six years as a member of the Ohio State Board of Agriculture, during one year of which he was president of that body. He also served upon the board of trustees of the Ohio State University and as president of the Ohio State board of managers of the penitentiary. In March, 1897, he was appointed by President McKinley to be Assistant Secretary of Agriculture.

During his term of service in the latter office, in addition to his other duties, he was called upon to give much attention to the exhibits prepared by this Department for exposition purposes, and was selected as the Department representative on the Government board for the

Omaha, Buffalo, Charleston, and St. Louis expositions. In each case he was chairman of the Government board, a position of much responsibility and involving the administration of large funds. The success not only of the Department's exhibits, but of the Government exhibit as a whole at these expositions, was due in no small measure to his efficient administration.

The resolutions passed by the chiefs of the bureaus and divisions of the Department at the time of his death are a fitting tribute to his career and to the esteem in which he was held:

"During a service of over seven years as Assistant Secretary, Colonel Brigham, by his qualities of heart and head, deserved and gained the confidence of all with whom he had official relations. In addition, he won the personal regard of all who knew him. The lasting achievements of his busy life, especially his services to agriculture, have won for his name an enduring renown, no less marked than the love and affection which follow him to the grave."

In a recent address delivered by Prof. T. C. Chamberlin, of the University of Chicago, a strong plea was made for the importance of research, both from the standpoint of pure science and its influence upon the progress of learning, and also from that of utilitarian ends. Much of what was said has a direct bearing upon agricultural education and research, and examples from the work of the experiment stations were cited to enforce the speaker's deductions.

The title of the address was The State University and Research,[a] and the occasion of its delivery was the semicentennial jubilee of the University of Wisconsin. Professor Chamberlin laid down the broad proposition that "the fundamental promotion of education lies in an increase of the intellectual possessions of a people, and in the mental activities and attitudes that grow out of the getting, the testing, and the using of these possessions. . . . True ideas work incessantly and unswervingly toward a destined end, while the thousand little waves of merely personal influence cross one another's paths and work one another's destruction. Determinate truth is radioactive, and sends forth a constant stream of penetrating, illuminating emanations, to which only the most leaden intellect is opaque. The discoverers of great truths and the authors of great ideas are the great educators."

He maintained that the education of the individual does not necessarily secure real educational advancement, for if we convey to the rising generation only such ideas as have been inherited, the summit-level of education is not raised. "There is only a Chinese dead-level of ancestral propagation;" and, it may be added, this represented to a considerable extent the condition of agricultural education up to within quite recent times. Some progress was made by voluntary research

[a] Science, Aug. 5, 1904, p. 161.

and by the accretions of common experience, but the fundamental basis of progress was very largely lacking.

To secure laudable progress in the fundamental condition of education, Professor Chamberlin held that systematic provision for scientific research is requisite, and he used the term in a broad sense to include rigorous investigation in any field. "To give this research its best adaptations to the needs of a people, it should be systematically controlled in the lines most tributary to these needs. To make the results available to all who will use them, suitable means for dissemination are requisite. Inevitably the highest intellectual training will grow out of this, for such training is both the prerequisite and the outcome of the struggle to find truth and to test it. Out of this training will come the best possible development of intellectual capacity, of right attitude toward truth, and of considerate action controlled by the scientific spirit."

The change which has taken place in Wisconsin in the attitude toward agricultural questions, as a result of the research and extension work which has been carried on, was cited by the speaker in illustration of the application and far-reaching importance of this phase of education. He said: "It was my privilege to compare the agricultural conventions of this State at two periods separated by a decade, within which the experiment station became a potent influence. The dominant intellectual and moral attitude of the earlier period was distinctly disputatious and dogmatic. Opinions and floating notions played the part that should have been reserved for demonstrations. Interpretations were loose and close analysis rare. In the second period the dominant attitude was that of a scientific conference. Opinions were replaced by demonstrations or by tentative hypotheses. Conviction was sought by the presentation of determinate facts, gathered by experiment and laborious observation, carefully analyzed, and cautiously interpreted. The whole was characterized by a notable approach to the methods of approved scientific procedure. The intellectual and moral contrast of the two periods was one of the most pronounced expressions of advance in the higher education in a great mass of people in the midst of practical life which it has ever been my privilege to witness."

This is a very strong statement and a high tribute to the intellectual and moral uplift growing out of this work—a phase of the result which has seldom been fully appreciated; but the counterpart of the changed condition described in Wisconsin can be found in many other States in the Union to-day, and it is after all of far deeper significance than the more tangible material results.

As bearing upon the relative importance of education for the individual and investigation for the masses, Professor Chamberlin expressed his conviction that while it is a legitimate function of the

State to train boys to be farmers, it is "a much higher and truer function to develop the science of agriculture, to increase the intellectual activity of every farmer, to improve the agricultural art on every farm, and by such improved art to furnish better and safer food to every citizen."

Thus, without disparaging or underrating the value of educating the individual, systematic investigation, which extends the sum of human knowledge along useful lines and disseminates the results so as to make them available to all who will use them, is given a fundamental significance and a place of paramount importance in the general scheme of education.

The thesis is not a new one in science, but it is given a new force by its application to research in agriculture. Few lines could be found which furnish more tangible or convincing evidence of the value of investigation; and the plan of organization under which it has been carried on, coupled with the prompt dissemination of information through bulletins, the farmers' institutes, and other agencies, has been singularly suited to popularize it and give it wide influence.

Investigation has preceded and made possible the new agricultural education, as well as created the demand for it; and while the needs of the people engaged in the art were being studied systematically, and the masses enlightened by bringing the results to their doors, a science of agriculture was being gradually built up by the classification of existing knowledge and the contribution of much that is new. The movement has reached a position where it is attracting the attention of men of science in other lines, and incidentally it has done much to popularize scientific research as a whole and to give confidence in its utility. It is interesting that Professor Chamberlin, with his wide familiarity with research in various branches of science, should have drawn the principal illustration in his argument for research from agriculture; and seldom, it may be noted, has the case for agricultural research been presented more forcefully.

The bulletin on the Agricultural Experiment Stations in Foreign Countries, issued by this Office over two years ago, has been thoroughly revised, and the revision is now in press. The original edition was regarded quite largely as preliminary and intended to serve as a basis for a more complete collection of data. Clippings from it were sent to the directors of the stations and agricultural officials abroad for revision, and in this way most of the data have been verified and supplemented.

As compared with the original bulletin, which listed about 720 experiment stations and similar institutions, this bulletin contains accounts of 798 such institutions arranged in alphabetical order by countries and

cities. Among these, however, are included many institutions which for lack of further information are mentioned in the bulletin by title only, and a quite large number of experimental fields, laboratories, and other enterprises which in this country would not be called stations. Briefly stated, the list includes the various agencies of different kinds and grades for experiment and investigation in agriculture and for the protection and information of farmers. Purely as a matter of convenience, these agencies may be referred to collectively as "stations." As far as possible an attempt has been made to give an idea of the systems in the different countries, and this is followed by a description of the individual stations, their origin, personnel, equipment, revenue, and lines of work.

The revised bulletin demonstrates not only the world-wide extent of the station movement at the present time, but also the substantial growth of the movement during the past two years. Nearly every civilized country of the globe now has its system of institutions for research in agriculture. The most notable exception in Europe is Greece, where, so far as can be learned, there are no stations or similar agencies in operation. In Asia there are a goodly number of stations, located in Russia, Japan, and British India. The Chinese Empire represents a large area which is entirely without stations, and the same condition applies to Turkey, Persia, Afghanistan, and Beloochistan. Africa has quite a large number of stations in the English, French, and German colonies, and several of these are of quite recent origin. There are no stations as yet in Mexico or in Central America except in British Honduras, where a botanical garden is located; and of the South American countries no trace has been obtained of any stations in Bolivia, Colombia, Ecuador, Patagonia, Peru, Uruguay, or Venezuela. Australia and New Zealand have a large number of stations of various kinds, which are actively studying the practical problems suggested by the agriculture of those countries.

The largest number of separate agencies for investigation and experiment in agriculture is found in Russia, in spite of the fact that the movement is comparatively recent there. That country has 115 such establishments and three experimental forests. Many of them are small demonstration fields, established for the purpose of instructing the peasants or of introducing new agricultural industries; others serve as the centers for the production and distribution of improved varieties of seeds and plants, and some are conducted as institutions for research. There are a number of stations for special crops, such as tobacco, sugar beets, silk, cotton, olives, tea, wines, and other products.

In Germany there are listed 87 stations; in France, 74; in Japan, 58; in Austria, 40; in Australia, 35; in Great Britain, 32; in Sweden, 26; in Italy, 25; in Hungary, 22; in Belgium, 16; in Norway, 12; in Switzerland, 11; in Denmark, 10, and in the Netherlands, 7.

A comparison of foreign and American experiment stations makes it apparent that the latter represent a distinct class of institutions, which are the product of their environment. The exact prototypes or counterparts of the American stations are not found in any other country, either in scope, organization and management, or in relation to the farming community and the promotion of agriculture in general. The American station is an adaptation of the European station to the conditions and requirements of this country, and thus presents many unique features.

Taken as a whole, the foreign experiment stations are working in the main independently of one another, there being very little cooperation between the stations of any country or with the central department of agriculture. Such cooperation, which is becoming more extensive in this country each year, may be regarded as one of the characteristic features of the American system.

Attention is called to abstracts given elsewhere (pp. 15–17), describing the utilization of strongly condensed light at right angles to the plane of the microscope. The mechanism of the microscope employed does not differ from those in common use, the only difference being in the sidewise illumination, so focussed as to render the smallest particles visible by their reflecting the light thrown upon them.

The early experiments with this new microscope indicated that it was adapted to use only with liquids, and studies of glycogen, proteids, urine, etc., of great exactness were reported. Recently[a] it has been found to be adapted to studying living organisms, and especially bacteria. It is claimed that with the focal illumination, micro-organisms one-fourth of a micromillimeter in size can be readily distinguished in form, without any preliminary cultivation, staining or other process.

Of course only objects having a different refractive index from that of the medium in which they are suspended can be viewed with this new form of instrument, but with it it seems possible to open up an entirely new field of investigations in physiological chemistry, bacteriology, and related branches.

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[a] British Med. Jour., 1904, No. 2275, Epit., p. 20.

NEW LIVE STOCK BUILDING AT THE MINNESOTA COLLEGE OF AGRICULTURE.

A building, to be used in connection with the instruction in live stock at the Minnesota School and College of Agriculture, is now in process of construction and will be completed during the fall. The building will serve as headquarters for the live stock department of the station, as well as the college, but is designed principally for the instruction in live stock judging and other branches of animal husbandry.

It is quite unique for a building of this sort, and includes a number of features not usually found in the live stock pavilion or the barn. It is in fact a combination of the live stock pavilion, with recitation rooms and offices, and the stable. The stables accommodate only a

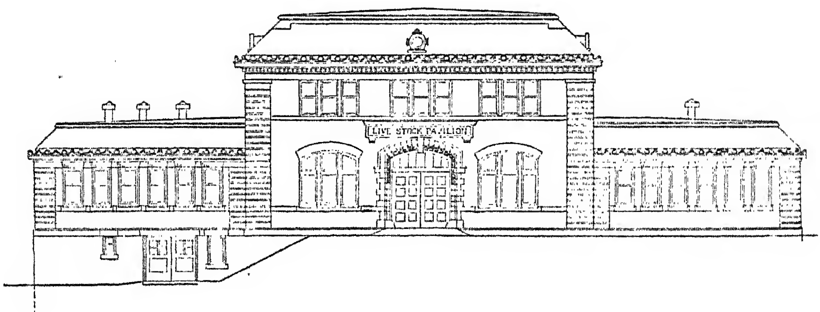

FIG. 1.—North elevation, live stock building, Minnesota College of Agriculture.

limited number of animals and are intended for temporary use, to house the animals while they are being used for instruction purposes. Stock for this purpose is frequently borrowed in order to obtain suitable specimens for illustration, and such animals will be stabled in the barn forming a part of this building while they are at the college grounds. Stock belonging to the college will also be more conveniently housed in this building during the period when it is being used.

The new building will be of brick, with blue limestone foundation and Indiana buff Bedford stone trimmings, and will have a slate roof. It will have a frontage of 136 feet, with a depth of 76 feet in the main part. As shown by the front elevation (fig. 1), it presents the appearance of a central part with wings on either side.

The central portion of the building is two stories high. The first floor (fig. 2) is occupied by an arena extending across the entire front, with class rooms at either end, which can be cut off by sliding doors. The arena proper is provided with a tan bark floor 25 by 104 feet in extent, making it possible to study the gait of a horse without going out of the building. The central part has an amphitheater at the back, seating 225 persons. The two class rooms in the wings are each 36½ by 54 feet, and will accommodate about 150 students each, the

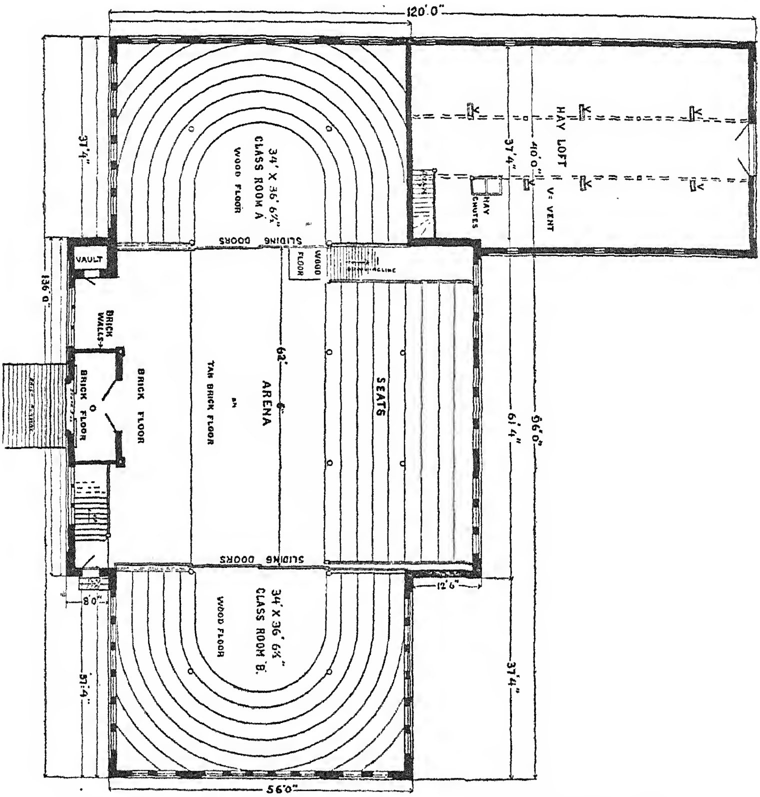

FIG. 2.—First-floor plan, live stock building, Minnesota College of Agriculture.

seats being arranged in semicircular form. All can be thrown together into one large audience room for demonstrations or meetings.

The animals will be brought up to the arena from the stables below over inclines built at an easy grade. Between the tan bark floor and the front of the building will be an area covered with a brick floor, which can be used for instruction in harnessing and hitching up teams, grooming horses, etc.

The second floor of the building (fig. 3) will contain two offices for the department of animal husbandry, a workroom, a museum, and a class room for animal feeding. The workroom will be used for the study of pedigrees, the keeping of feeding records, and for microscopic work. It will be 22 by 28 feet, while the museum and class room will each be 30 by 39 feet in size. On this floor will also be located a dark room, toilet, and a vault for the storage of records and other valuable books.

In the left or east wing are located the stables for the live stock, in a basement and subbasement. The land slopes away from the front

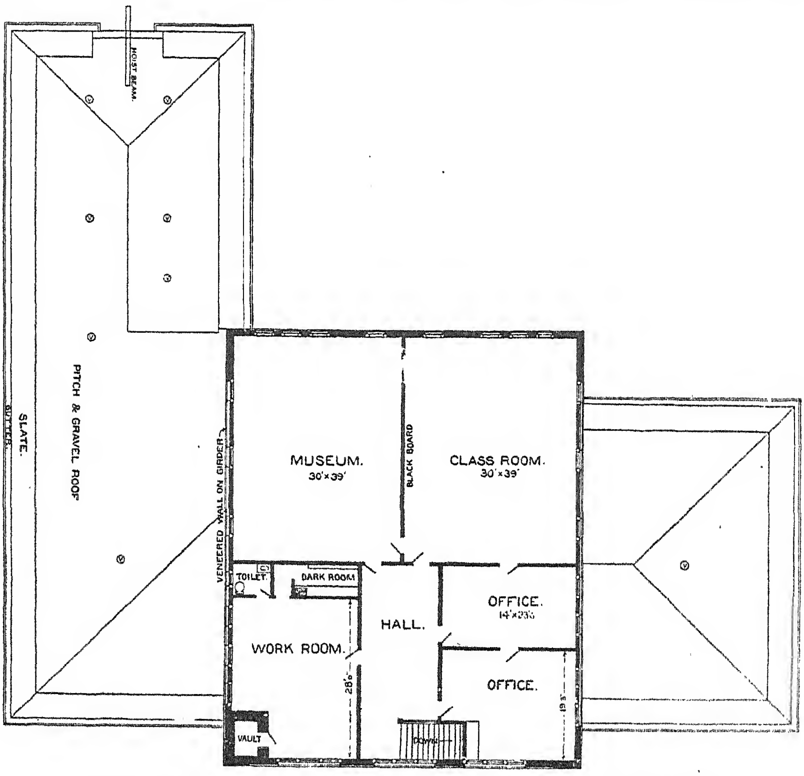

FIG. 3.—Second-floor plan, live stock building, Minnesota College of Agriculture.

in such a way as to make both the basement and the subbasement almost entirely above ground. The subbasement will be used for cattle, and the floor above for horses. This wing runs back something over 50 feet beyond the main part, so that on the basement floor (horse barn) it has a depth of 120 feet from front to back, and a width of 40 feet.

The subbasement, or cattle barn (fig. 4), will have a cement floor and be provided with iron stable fittings. It will contain a number of box stalls, and a root cellar, which will extend into the side hill; and

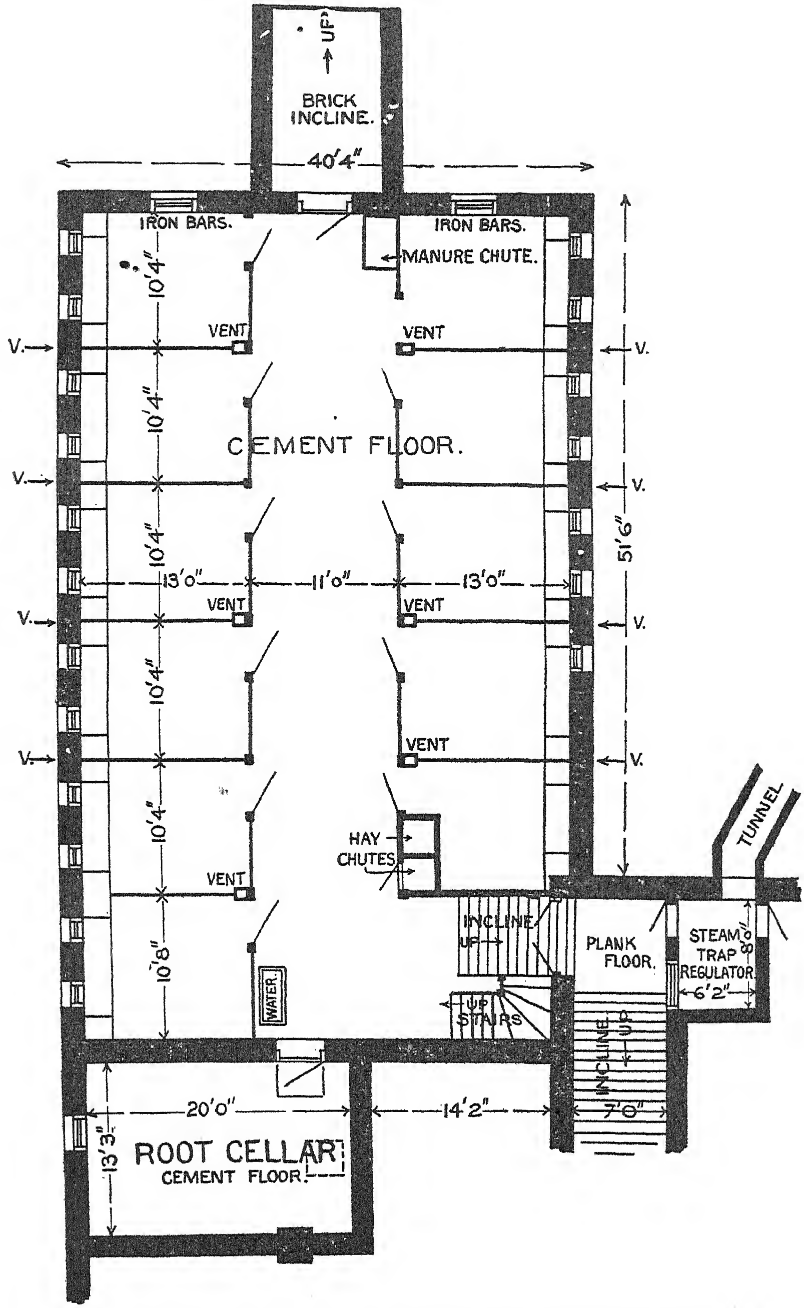

FIG. 4.—Subbasement (cattle barn), live stock building, Minnesota College of Agriculture.

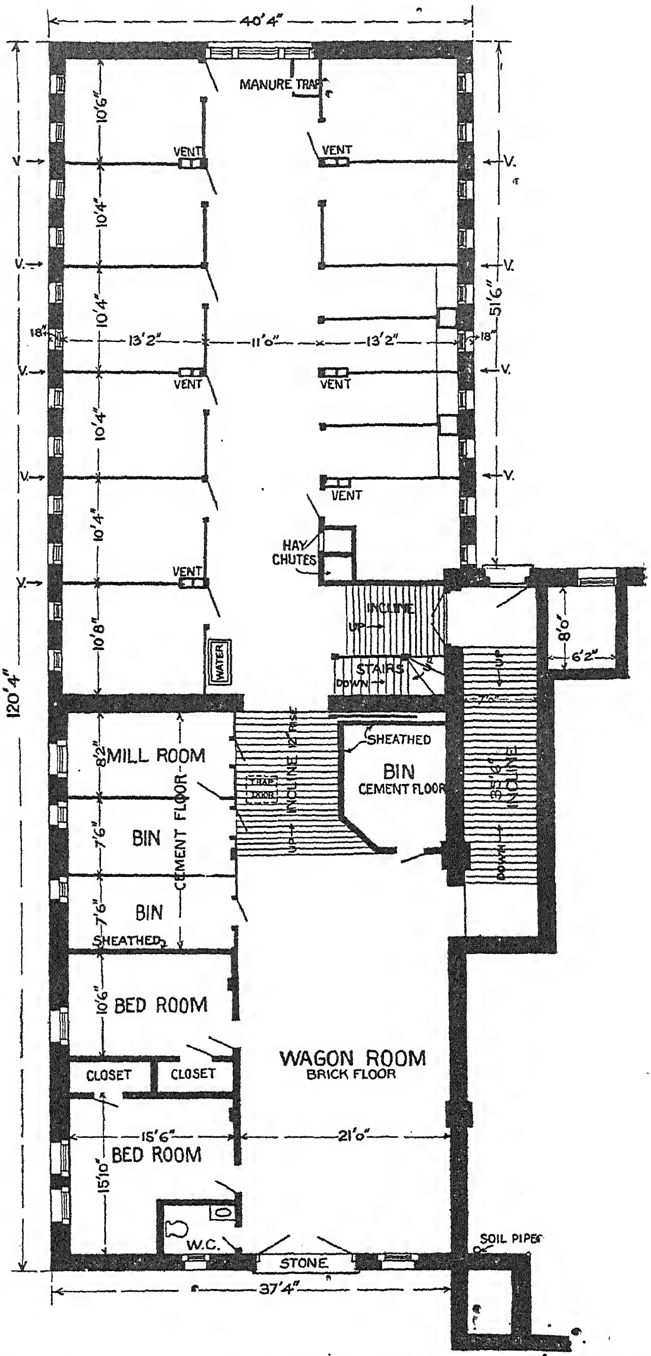

FIG. 5.—Basement (horse barn) live stock building, Minnesota College of Agriculture.

will be provided with hay chutes, a manure chute, and a ventilation system. The tunnel furnishing the building with heat from the central heating plant will enter the building through the subbasement.

The horse barn (fig. 5), located on the floor above, will also be provided with box stalls, and in the front part will contain a large wagon room. On this floor will also be located the bins for grain, two rooms for attendants, and a toilet. The hay loft will be in the attic above the portion of the wing used for stables. The finish in the stables will be in the rough brick; the bedrooms will be plastered and finished in pine, as will also the offices.

The building is being erected out of a State appropriation made by the last session of the legislature and now available. It will cost, with equipment, about $33,000 to $35,000. It will be heated from the central heating plant of the college, and lighted throughout by electricity. It is centrally located, convenient to the cattle stables and the hog and sheep barns, and adjacent to the building erected a few years ago for slaughtering, cutting up, and curing meats.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Comparison of methods for the estimation of soil acidity, F. P. VEITCH (*Jour. Amer. Chem. Soc., 26 (1904), No. 6, pp. 637–662*).—Comparative studies of the sodium chlorid method devised by Hopkins, Pettit, and Knox (E. S. R., 14, p. 111) and the limewater method devised by the author (E. S. R., 14, p. 418) are reported. From the results obtained the author concludes that in the sodium chlorid method "there is no setting free of appreciable quantities of hydrochloric acid, and that there is practically no reaction between the organic matter and the salt solution, whereby difficultly soluble organic acids are dissolved, but that the acidity of the filtrate (or that acidity which is greater than would be given by water under the same conditions) is due to the solution of alumina or some other acid-salt yielding base. It appears that the hydrated neutral silicates or aluminates are quite strongly attacked by the salt solution, resulting in the replacement of aluminum by sodium, or a breaking up of the compound, and the consequent formation of an acid solution of aluminum chlorid, the titration of which, with alkali, constitutes the apparent acidity as determined by this method."

He further concludes that the method can not be relied on for the determination of the total apparent acidity of a soil, or to show the acidity injurious to sensitive crops. "A soil limed in accordance with the results of the sodium chlorid method is never alkaline unless indeed the lime requirement by this method is as great as the lime requirement by the limewater method."

It is plain that the limewater method "shows the maximum lime requirements of soils—that is, it shows the amount of lime required under the most favorable conditions of distribution to make them alkaline in reaction," and it is believed to be "the wisest practice to apply lime in sufficient quantities to render the cultivated soil slightly alkaline in reaction, and consequently to use a method which will indicate this quantity."

The limewater method as modified and improved is as follows: "To determine the reaction of a soil: About 10 gm. of soil are treated with 100 cc. of distilled water in a Jena flask and allowed to stand over night. Fifty cubic centimeters of the supernatant liquid are carefully drawn off and boiled with a few drops of phenolphthalein in a covered Jena beaker until the appearance of the pink color or to a volume of about 5 cc. with no development of color. The pink color shows the soil to be alkaline, while no color shows it to be acid or neutral.

"To determine the degree of acidity: To three portions of soil, each consisting of as many grams as the standard limewater contains milligrams of lime (CaO) per cubic centimeter, add 50 to 60 cc. of distilled water and different amounts of standard limewater. For example, to the first add 10 cc., to the second 20 cc., and to the third 30 cc. of limewater. Dry down at once on the steam bath, transfer to stoppered Jena flasks with 100 cc. of distilled water, allow to stand over night, with occasional shaking, draw off 50 cc., place in a Jena beaker, add a few drops of phenolphthalein solution, and boil until the appearance of the pink color; or, in

case no color is developed, to a volume of about 5 cc. Then, with two portions of treated soils, one of which has been rendered alkaline by the limewater and the other of which is still acid, as guides, prepare three fresh portions of 10 gm. each and add limewater as before, except that the amount added to a dish differs from that added to another by 1 or 2 cc. Dry, take up with 100 cc. of water, allow to stand, draw off, and treat exactly as before. The smallest amount of limewater which gives the characteristic pink color is taken as the acidity equivalent of the soil. Each cubic centimeter of standard limewater is equivalent to an acidity of 0.01 per cent expressed as calcium oxid.

"It is essential that the distilled water used be free from alkalis and acid."

Notes on rapid soil analysis, V. Edwards (*Chem. News, 89 (1904), No. 2316, pp. 183, 184*).—Rapid methods of determining water, phosphoric acid, iron and alumina, lime, potash, and nitrogen are briefly described, and the significance of these various determinations with reference to the use of fertilizers is briefly discussed.

On the determination of phosphoric acid as magnesium pyrophosphate, K. K. Järvinen (*Ztschr. Analyt. Chem., 43 (1904), No. 5, pp. 279–282*).—The author claims that dimagnesium-ammonium phosphate is precipitated and accurate results are thus assured when precipitation is effected as follows: Make the phosphoric acid solution feebly alkaline with ammonia and pour the solution slowly with constant stirring into a perfectly neutral solution of a mixture of magnesium chlorid and ammonium chlorid (102 gm. of the former and 53 gm. of the latter per liter), using about 10 cc. of the solution to each 0.1 gm. of phosphoric acid. The precipitate is crystalline and forms slowly and should carry down with it all free ammonia. Otherwise trimagnesium-ammonium phosphate is formed and the results are too high.

The volumetric determination of potash in the form of double hyposulphite of potassium and bismuth, W. Küster and M. Grüters (*Ztschr. Anorgan. Chem., 36 (1903), pp. 323–331; abs. in Bul. Soc. Chim. Paris, 3. ser., 32 (1904), No. 11, p. 701*).—This is an account of tests of Carnot's method, which is condemned as unreliable.

The determination of nitrogen, L. Débourdeaux (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 10, pp. 578–580*).—A method is described which it is claimed converts the nitrogen of the following groups of nitrogenous substances into ammonia without mixture of amins: Oxidation compounds of nitrogen, hydroxylamin, nitrogen derivatives of which the nitrogen nucleus contains a phenol group, nitriles, cyanids and double cyanids, cyanates and sulphocyanates, amids and imids in which the nitrogen is not further replaced by a carbon radical, and amins with an acid radical.

The determination is made in a modified Schloesing apparatus of glass as follows: Distill the substance nearly to dryness with 50 gm. of crystallized potassium hyposulphite and 200 cc. of a solution of potassium monosulphid. The latter solution is obtained by saturating a given volume of potash solution, 36° B., with hydrogen sulphid and mixing this with an equal volume of untreated solution. Distill a second time to remove the last traces of ammonia with 25 cc. of potash solution and 250 cc. of water, continuing the distillation until about 150 cc. of distillate has been obtained. The ammonia is determined by titration in the usual manner.

Estimation of nitrites in waters, J. Desfourniaux and L. Robin (*Ann. Chim. Analyt., 9 (1904), pp. 68, 69; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 499, II, p. 367*).—Desfourniaux describes a method based on the liberation of nitrous acid by salicylic acid, in the presence of potassium iodid, and titration of the iodin thus set free. Robin calls attention to his own process, published in 1898, which is practically the same as that of Desfourniaux, acetic acid being used instead of salicylic acid.

The rendering visible of ultramicroscopic particles and their measurement, with especial reference to glass colored with gold, H. Siedentopf and R. Zsig-

MONDY (*Ann. Phys.*, *4. ser.*, *10* (*1903*), *No. 1*, *pp. 1–39*, *figs. 13*).—A method of so lighting objects that those ordinarily invisible under the microscope are rendered visible is described, which is similar in principle to the commonly observed fact that a beam of sunlight in a darkened room renders moats visible.

Light was collected and allowed to strike on the material to be examined at right angles to the line of vision through the microscope. It was found that materials were rendered visible which were in size somewhere between molecular dimensions and the length of a light wave. The minute particles rendered visible had in general a brilliant appearance. The accuracy of the method, its theoretical limitations—that is, the size of the smallest particles which can theoretically be rendered visible—as well as related topics, are discussed and results of a number of experiments with glass colored with gold are reported.

The author points out that the method is capable of application to the examination of colloid substances and similar bodies, and there is no theoretical reason why large complex molecules such as occur with proteids, potato starch, etc., should not be rendered visible.

Ultramicroscopic investigations, MUCH, RÖMER, and SIEBERT (*Ztschr. Diätet. u. Phys. Ther.*, *8* (*1904*), *Nos. 1*, *pp. 19–27*; *2*, *pp. 94–96*).—Using the method and apparatus devised by Siedentopf and Zsigmondy (see above), the authors studied especially the proteid bodies in a number of substances, including horse serum, milk, milk serum, mucin solution, etc.

It was found that when the method was applied to proteid solutions glittering moving particles were observed, which varied in number with the concentration of the solution. These particles were regarded as the protein molecules or molecular groups. The authors devised a method of studying the proteid solutions quantitatively, which depended on diluting the solution to such an extent that only three or four of the glittering particles were observed in the field of vision. The amount of dilution is called the "ultra value." This varied in substances examined from 250 with Marburg nutrient bouillon to 800,000 with milk serum.

A number of samples of urine were examined, and it was found that the method was especially satisfactory for the detection of albumen, and in the authors' opinion is as valuable for the quantitative determination of albumen as is the polarization apparatus for the determination of sugar.

Some of the experiments reported had to do with the products of digestion. It was found that when 0.5 gm. of globulin from horse-blood serum was mixed with 0.5 gm. pepsin and 0.2 gm. hydrochloric acid, and diluted to 100 cc., that the ultra value was 100,000. After standing for half an hour in the incubating closet the ultra value was 100, and after one hour and a half, 25. When milk was digested with pepsin and hydrochloric acid no diminution in the number of particles was noticeable. This was also the case when digested with pancreatin, but if the pancreatin digestion followed that with pepsin and hydrochloric acid the number of particles diminished.

Twenty cubic centimeters of fat-free milk diluted with distilled water to 100 cc. had an ultra value of 750,000, and showed large particles and particles which were smaller and less glittering. Treated with 0.1 gm. pepsin and 0.4 gm. of 25 per cent hydrochloric acid, this quantity of fat-free milk had an ultra value of 500,000 after standing in the incubating closet 2 hours, and an ultra value of 750,000 after standing 24 hours. This remarkable increase in the number of visible particles was confirmed by control experiments. After standing 62 hours the value decreased to 250,000, and none of the large light particles were observed.

Tests were also reported with whey (lacto serum), which the authors consider of especial interest on account of the bactericidal properties. The conclusion was reached that the bactericidal and agglutinating properties go hand in hand with the number of particles rendered visible by the "ultra apparatus." In these tests and

others which were made with horse-blood serum the solutions were treated with an electric current, and the anode and kathode serum and that between the two electric poles was studied. The electric current modified the liquid; horse serum from the anode having a much more marked bactericidal action than untreated serum. In one test the ultra value of untreated serum was 200,000, that of the anode serum 7,000,000, and that of kathode serum 80,000. Differences in the appearance of the serum particles visible with the ultra apparatus are described.

The article contains a brief discussion of molecular energy, with special reference to the kind of investigations reported.

Ultramicroscopic studies of solutions of albumins and carbohydrates with a new optical method for the estimation of albumin in albuminuria, E. Raehlmann (*München. Med. Wchnschr., 50 (1903), No. 48, pp. 2089, 2090*).—Using the method described above, the author studied a number of solutions of proteids and carbohydrates. The method renders visible the proteids in solution even when the individual particles are only 0.000005 mm. in size. These proteid particles appear like specks of light and are in motion. The number of visible particles diminishes with dilution. The application of the recorded data to the study of pathological urine is pointed out.

The carbohydrates examined included dextrin, gum arabic, grape sugar, milk sugar, and glycogen. The results obtained with all these bodies were similar to those with proteids, i. e., extremely minute particles were rendered visible. In the case of the different carbohydrates the appearance of the particles was similar, larger and smaller particles being noted in every case, most of which polarized light. The particles were in motion. The relation, if any, between the number, size, appearance, etc., of the particles and their chemical constitution is a subject for further investigation.

Diastase, when examined by the ultramicroscopic method, showed particles which were similar to those of the other carbohydrates, yet presented some individual characteristics. The glycogen particles were visible in a dilution of 1 to 3,000,000, and were in size equal to about 0.00006 mm., or 0.1 of a wave length. They had a characteristic gray-white color and differed little in size. In moderately dilute solutions the distances between the glycogen particles were about equal and the particles moved with a vibratory motion. In a solution twice as dilute the distance between the particles was twice as great and the energy of the motion seemed correspondingly diminished. At the greatest dilution studied the motion was only minimum. When a drop of diastase was added to the glycogen solution the particles changed instantly in appearance, being replaced by a much smaller number of large and small particles.

Ultramicroscopic investigations, Raehlmann (*Berlin. Klin. Wchnschr., 1904, Feb. 22; abs. in British Med. Jour., 1904, No. 2275, Epit., p. 20*).—Methods of experimenting with Siedentopf's microscope (E. S. R., 16, p. 15) are described. According to the author this instrument may be used for the study of living micro-organisms as well as chemical bodies. It must be remembered that the refraction of light affects only those parts of the particle or micro-organism examined which fall directly in the line of light, and only substances which have a different refraction from the medium in which they are suspended can be seen. The author describes various forms of putrefactive bacteria which he has been able to study by the methods pointed out. He has also observed the effect of bactericidal and antiseptic substances and of electric currents on micro-organisms.

The distribution of nitrogen in the proteid molecule, T. Gümbel (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), p. 297; abs. in Zentbl. Physiol., 18 (1904), No. 4, pp. 93, 94*).—A critical discussion based on analytical data.

Concerning the nitrogenous compounds in ungerminated seeds, E. Schulze and N. Castoro (*Ztschr. Physiol. Chem., 41 (1904), No. 5, pp. 455–473*).—Yellow and white lupines, sunflower seed, wheat germ, and peanut germ were studied. According to the author, arginin, tyrosin, and asparagin are among the nitrogenous compounds in unsprouted seeds which are concerned in the proteid cleavage in

plants. In 2 of the seeds (yellow lupine and peanut germ) vernin was identified. A study of this body led to the conclusion that it contains a carbohydrate group and is to be regarded as a glucosid.

The nature of the principal phosphorus compound in wheat bran, A. J. PATTEN and E. B. HART (*New York State Sta. Bul. 250, pp. 169–176*).—Previous investigations (E. S. R., 15, p. 496) having shown that 86.5 per cent of the phosphorus of wheat bran is, on an average, soluble in water, the nature of this phosphorus was investigated.

The wheat bran was extracted with 0.2 per cent hydrochloric acid for several hours, with frequent stirring, and filtered. Practically the entire amount of phosphorus in the filtrate was in the form of a phospho-organic acid present in the bran as magnesium-calcium-potassium salt.

The free acid was prepared from the salt present in the wheat bran and its properties studied. When heated with concentrated mineral acids, it broke up quantitatively into inosite and phosphoric acid.

"The free acid corresponds to the formula $C_2H_8P_2O_9$, and is probably identical with Posternak's anhydro-oxymethylene diphosphoric acid. The alkali salts of this acid are freely soluble in water. The calcium and copper salts are slightly soluble, while the barium and strontium salts are but sparingly so. The acid and its salts seem to be of wide distribution in the vegetable kingdom, having already been isolated from the seeds of red fir, peas, beans, pumpkin, red and yellow lupine, also from the potato and other tubers and bulbs."

Cleavage products of elastin, E. ABDERHALDEN and A. SCHITTENHELM (*Ztschr. Physiol. Chem., 41 (1904), No. 4, pp. 293–298*).—Quantitative determinations of the products obtained by the hydrolysis of elastin are reported. The following were found: Glycocoll, leucin, alanin, phenylalanin, α-pyrrolidin-carbonic acid, glutaminic acid, and aminovaleric acid.

Notes on lupeol, E. SCHULZE (*Ztschr. Physiol. Chem., 41 (1904), No. 5, pp. 474–476*).—Data regarding lupeol, a body obtained from yellow lupines, are reported.

On the detection of cocoanut oil in lard, F. MORRSCHÖCK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, pp. 586, 587*).—Determinations were made of the refractometer, iodin absorption, and saponification numbers of 3 samples of lard; the alcohol extract of these samples, and of the residue left from the alcohol extract.

In extracting with alcohol the fat was treated with either 2 or 3 volumes of alcohol and heated to 45 or 60° C. on a water bath. From 1.65 to 2.38 per cent of the fat was dissolved in the alcohol. Mixtures were also made of lard and 5 or 10 per cent of cocoanut oil and examined in the same manner. The alcohol extract of the pure samples showed a refractometer number of 2.7 to 3.4, a saponification number of 192.2 to 194.1, and an iodin number of 69.13 to 70.11, while the mixture of lard and 5 per cent of cocoanut oil showed a refractometer number of −0.1, a saponification number of 206.6, and an iodin number of 56.93, and the mixture of lard and 10 per cent of cocoanut oil a refractometer number of −3.4, a saponification number of 221.6, and an iodin number of 46.56.

The author concludes that this method is of great value in determining the presence of cocoanut oil in lard.

On the detection of butter adulteration by means of the phytosterin acetate test, M. SIEGFELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, pp. 577–585*).—The author prepared cholesterin and cholesterin acetate from gallstones, lard, whale oil, and butter fat; and phytosterin and phytosterin acetate from rape-seed oil, cotton-seed oil, sesame oil, and cocoanut oil, and determined the melting points of the different preparations in order to ascertain the accuracy of the Bömer method for the detection of butter adulteration with vegetable oils and fats.

The melting point of the different preparations of cholesterin acetate varied from 113.6 to 115.4° C. The melting point of the different preparations of phytosterin

acetate varied from 128.3 to 136.5°. Acetates were also prepared from different fat mixtures and determinations made of the melting point. The results of the author's investigations confirm the work of Bömer, that the difference in the melting points of the acetates afford a reliable means of determining the presence of vegetable fats in animal fats.

A contribution to the investigation of cheese, J. B. NAGELVOORT (*Pharm. Weekbl., 41 (1904), No. 2-4, pp. 289-295; abs. in Chem. Centbl., 1904, I, No. 17, p. 1234*).—A method is given for the determination of moisture and fat in cheese.

New bases derived from sugars, ROUX (*Ann. Chim. et Phys., 8. ser., 1 (1904), Jan., pp. 72-144; Feb., pp. 160-185*).—In the investigations here reported over 40 salts and derivatives are described as new products.

Apparatus and method used in saponifying compounded oils, P. H. CONRADSON (*Jour. Amer. Chem. Soc., 26 (1904), No. 6, pp. 672-675, fig. 1*).

An extraction apparatus with mercury seal, O. VON CZADEK (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 5, pp. 443, 444, fig. 1*).—A combination of Soxhlet extractor, flask, and condenser is illustrated and briefly described.

A new burette cock, F. PILZ (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 5, pp. 441, 442, figs. 2*).—A modification of the Mohr device.

Miscellaneous chemical investigations (*Wisconsin Sta. Rpt. 1903, pp. 314-317*).—This is a summary of the following articles previously published by the station: Analyses of Wisconsin Soils, by F. W. Woll (E. S. R., 9, p. 536); The Marls of Wisconsin, by F. W. Woll (E. S. R., 8, p. 208; 9, p. 543); On the Yield and Composition of Sow's Milk, by W. A. Henry and F. W. Woll (E. S. R., 10, p. 782); The Composition of Sow's Milk, by F. W. Woll (E. S. R., 12, p. 84); A Rapid Method for the Estimation of Salt in Butter, by A. Vivian (E. S. R., 13, p. 16); Tables for Use in Kjeldahl Method for Determination of Nitrogen, by A. Vivian (E. S. R., 13, p. 16); An Apparatus Facilitating the Analysis of Sugar Beets, by R. H. Shaw (E. S. R., 13, p. 916), and Miscellaneous Chemical Work, by R. H. Shaw (E. S. R., 13, p. 916).

Proceedings of the twentieth annual convention of the Association of Official Agricultural Chemists held at Washington, D. C., November 19, 20, and 21, 1903, edited by H. W. WILEY (*U. S. Dept. Agr., Bureau of Chemistry Bul. 81, pp. 252*).—This is the official account of the proceedings of the convention, of which a summary was given in E. S. R., 15, p. 427. The bulletin also contains brief biographical sketches of the late Ervin E. Ewell and Norman Robinson, and also the constitution of the association.

BOTANY.

An investigation into the effects of water and aqueous solutions of some of the common inorganic substances on foliage leaves, J. B. DANDENO (*Trans. Canad. Inst., 7 (1902), II, No. 14, pp. 237-350, pls. 2, figs. 16*).—This paper gives the result of a series of investigations conducted to ascertain the effect of certain solutions of inorganic salts on foliage leaves, the effect of nutrient salts on the growth of young leaves developing from the bud, and also the statement that distilled water remaining on the leaf of the plant for some time becomes alkaline.

After giving a historical résumé of the subject the author describes his experiments in detail. It was found that wilted leaves, whether detached from the plant or not, will absorb water if immersed or if the water be applied to the surface in the form of a fine spray. Special parts of the leaves of certain plants seem to be particularly adapted to this absorption, as is shown by the surface of the epidermal cells over the veins and in other regions. Guttation drops and dew drops contain substances in solution which are generally resorbed by the plant. Carbonates present as incrustations may serve to store up, in the presence of moisture, carbon dioxid at night and utilize the same as the bicarbonate is reduced to the carbonate in the daytime.

Distilled water was found to become alkaline very generally if allowed to remain on the leaves of plants for a considerable time. Certain plants which are adapted to growth in moist climates may be made to take in all the food necessary for growth through the leaves. Distilled water used as a spray may for a time act as a stimulant to plant growth. This action may probably be due to the fact that it draws from the plant the surplus alkaline salts which, if too abundant in the cells, might become harmful. Rain water probably acts as a stimulus in the same way.

Solutions applied to the surface of detached leaves, or leaves still upon the plant, are generally absorbed, as shown by the increased content of ash. When so applied the solutions often stimulate a portion of the leaf to abnormal development, producing a ring upon the leaf by the peculiar action of the evaporating drop. When applied to the cut ends of the petioles of leaves, solutions generally kill the tissue at the termination of the tracheids, either by withdrawing the water from the intercellular spaces or by chemical action upon the walls of the cells or on the cell contents. The first determinable reaction after the death of the tissues is alkaline, even though the tissues themselves may be killed by an acid.

In the experiments reported it was found that substances in solution frequently ascend through the blade of the leaf at a rate which varies with the length of the different veins of the leaf. The lithium test, frequently used to determine the ascent of the liquid through plants, is often a source of error, as the water ascends faster than the salt in solution.

Experiments with woody branches of willows showed that the food required for the early spring growth of this shrub was water, and that nutrient solutions at this stage proved harmful. Water and other solutions applied to the twigs showed that they were not absorbed through the bark, but the indications showed that the absorption takes place through the buds.

Experiments with sea water showed that the effect produced upon the atmosphere results in an accumulation of rust upon iron greater than that produced upon the atmosphere under the influence of pure water; and it is concluded from this that a similar physiological process accompanying the chemical process may result with plants growing in the vicinity of the sea.

On account of the economic importance of the subject, the author devotes a considerable portion of the paper to the physiological effect of some of the constituents of Bordeaux mixture when used as a fungicide, and some of the causes of natural and artificial spotting of tobacco. The paper concludes with a bibliography of some of the more important work dealing with this subject.

The physiological action of iodin and fluorin compounds on agricultural plants, S. Suzuki and K. Aso (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 473–479, pl. 1*).—The authors having determined that potassium iodid in exceedingly high dilution exerted a stimulating effect on various plants, conducted experiments with this and sodium fluorid on a number of economic plants. With oats and radishes the stimulating effect of these chemicals was quite evident and the increased crop was made at a correspondingly very small cost.

In commenting upon the effect of potassium iodid the authors state that the substitution of the crude ash of seaweeds would probably be the most economical way of securing the iodid. Attention is called to the fact that farmers along the coast of Japan apply seaweeds as a green manure with very great success, and it is probable that this success is due not only to the small quantities of potash, nitrogen, and phosphoric acid, but also to the small quantity of iodin present.

The physiological effect of rubidium chlorid on plants, O. Loew (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 461–465, pl. 1*).—Pot experiments with Chinese cabbage, barley, and spinach are reported in which the effect of rubidium chlorid was tested. Where the chemical was added in amounts not to exceed 10 mg. per 50 kg. of soil a stimulating effect was noted, the treated plants being larger and the fresh and dry weights greater in nearly every instance. When applied at the

rate of 50 mg. per 50 kg. of soil the stimulating effect on the cabbage was apparent, but was not as great as when smaller quantities were used.

The influence of a certain ratio between lime and magnesia on the growth of the mulberry tree, K. Aso (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 495–499, pl. 1*).—Experiments are reported which seem to indicate that a normal development of the mulberry tree depends to a considerable extent on the ratio of lime and magnesia offered the roots. Pot experiments are reported in which the relation between the lime and magnesia varied from 1:3 to from 4:1; and the results obtained seemed to indicate that the best ratio of lime to magnesia for mulberry trees lies between 2 and 3 parts lime to 1 of magnesia. An excess of magnesia over lime retards growth; the leaves of the plants are small, but the symptoms of the dwarfing disease are not noticeable.

The influence of different ratios between lime and magnesia upon the development of Phaseolus, G. Daikuhara (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 501–503*).—Experiments are reported in which varying quantities of lime and magnesia were added to pots in which beans were grown, and based upon the vigor of growth, height of stems, and size of leaves the best ratio, at least before the fruiting stage of this plant, was 2 parts of lime to 1 of magnesia.

The effect of boric acid in high dilution on plants, M. Nakamura (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 509–512, pl. 1*).—It having been shown by various authors that soils in certain districts contain small quantities of borates and that the plants grown on such soils contain some boric acid, the author has reported on the effect of borax on cultures of barley. It was found that 50 mg. of borax per kilogram of soil acted injuriously on the development of the barley, and that even when used in as small a quantity as 10 mg. per kilogram of soil it had an injurious effect. When used at the rate of 1 mg. per kilogram of soil borax exerted a stimulating action on peas, and 5 mg. had a similar effect on spinach.

Can potassium ferrocyanid exert any stimulant action in the soil on plant growth? S. Suzuki (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 517, 518*).—It having been shown that potassium ferrocyanid in dilute solution is decidedly injurious to plants in water cultures, the author has investigated the presence of this chemical in soil as shown by the effect produced on barley.

To 1 series of pots containing 10 kg. of soil 0.1 gm. potassium ferrocyanid was added and to another 1 gm. Barley was sown in each pot and after a few weeks a decided difference was noticed in favor of the pot receiving 1 gm. potassium ferrocyanid. The favorable action in this case is believed to have been due to the decomposition of the potassium ferrocyanid by bacteria in the soil. For the present it is undecided whether the potassium ferrocyanid acts directly as a stimulant or whether its decomposition products are available as a source of nutrients for the plant.

Influence of the carbon dioxid given off by the soils on plant growth, E. Demoussy (*Compt. Rend. Acad. Sci. Paris, 138 (1904), pp. 291–293; abs. in Chem. Centbl., 1904, I, No. 11, p. 832*).—Experiments with lettuce plants indicate that growth was promoted by conditions favoring the evolution of carbon dioxid by the soil.

The ascent of water in trees, G. Macloskie (*Science, n. ser., 20 (1904), No. 499, pp. 116–118, figs. 2*).—The author discusses some recent investigations on the ascent of water in trees, and offers suggestions based upon well-known laws of physics that, in his opinion, aid in the explanation of this phenomenon.

The theory of functional capacity and its significance in agriculture, L. Daniel (*Trav. Sci. Univ. Rennes, 1 (1902), No. 3, pp. 415–481, figs. 10; 2 (1903), No. 2, pp. 73–272, pls. 20, figs. 81*).—An elaborate review, with many citations from the author's experimental work, and final broad generalizations are here given on the relationship existing between the absorption of plants and the assimilation and transpiration of the crude material absorbed. Plants which grow naturally are first

considered and then the abnormalities which are brought about by such horticultural practices as grafting.

By functional capacity is meant the processes involved in the absorption and utilization by the plant of crude materials. If the functional capacity of absorption or the total absorption from external surroundings be represented by *ca*, and the functional capacity of consumption or the total consumption at the points where the sap is used up be represented by *cv*, then in a plant which is in complete equilibrium as regards its general nutrition we have cv=ca and $\frac{cv}{ca}=1$. If, however, aerial consumption is greater than the usual subterranean absorption, then we have the formula $\frac{cv}{ca}>1$. This corresponds to growth in a dry or poor soil. When absorption is greater than consumption, corresponding to growth in moist or rich soils, the formula becomes $\frac{cv}{ca}<1$.

Conditions similar to these are sometimes brought about by grafting. The cicatrization of the grafted plants and the intercalated tissue between stock and scion interfere with the conduction of sap, modifying it both in quantity and quality. These modifications of the scion are equivalent to growth in a drier, poorer medium than the normal. In grafting it is also necessary to keep in mind the relative functional capacities of the two grafted plants. For if, for example, the functional capacity of consumption is greater in the scion plant than in the stock plant this condition becomes exaggerated by the scar of cicatrization when the two plants are grafted, and the graft either fails to take or makes a poor growth, corresponding to that in the poor, dry soil. The chance for making a successful graft in such a case is increased if the development of adventitious roots from the scion is encouraged, so that assimilation may correspond more closely to a normal absorption of the scion. Again, the same scion may be inserted on 2 stocks or additional attention given to manuring and watering the stock plant.

The discussion is accompanied by numerous drawings, showing the modification of the wood and the character of scars caused by grafting together plants of different functional capacities. The papers have been published in book form under the title La Théorie des Capacités Fonctionnelles et ses Conséquences en Agriculture. Rennes, France: Fr. Simon, 1902.

The influence of climate and soil on the transmitting power of seeds, W. W. TRACY (*Science, n. ser., 19 (1904), No. 488, pp. 738–740*).—An account is given of the practices followed by seedsmen with relation to the influence of soil and climate on the transmitting power of seeds. These practices are the results of long-continued experience rather than the result of scientific study.

In regard to leguminous plants, such as peas and beans, the author reports that on very rich soils or those which have been recently fertilized, a greater deviation from type will be noted than when the plants are developed on poor soils. A stock grown on a white-clay soil will ripen uniformly, while if planted on a rich mucky soil it will develop a large proportion of plants which are departures from the type. If seed of plants that have departed from the type are planted in soils favorable for the development of the true type they will produce nearly as great a proportion of typical plants as those grown from the seed produced from plants that did not show any departure.

In the case of garden beans there is apparently a tendency to produce thick fleshy pods, slow to mature, when grown on rich moist soils, while on warm, sandy soil the pods are less fleshy and quicker matured. These characteristics seem to be carried by the seed and are cumulative in character. So far as the author's observations go there does not seem to be any influence of climate shown by the seed of leguminous plants.

In the experiments with sweet corn no influence of soil has been noticed, but the author believes that the climatic conditions have a marked influence, and that the difference between stock grown in the East and West is a result of climatic rather than of soil conditions.

In the case of cucurbitaceous plants no variation due either to climate or soil was ever noticed.

In conclusion the author says: "Plants of different natural orders differ in the degree to which influences of soil and climate are transmitted through the seed."

Mutation in plants, D. T. MacDougal (*Amer. Nat., 37 (1903), No. 443, pp. 737–770, figs. 10*).—In this paper, which is No. 48 of the Contributions from the New York Botanical Garden, the author gives a review of the work of De Vries on mutation in plants, describing the various forms which have been developed from *Œnothera lamarckiana* in the botanical garden at Amsterdam. The result of the writer's investigations of a number of plants grown from seeds of these mutation forms are described at considerable length, particular attention being paid to *Œ. nanella* and *Œ. rubrinervis*. Both of these are clearly separable from the parent and from each other by physiological and taxonomic standards. These mutation derivatives are found to be constant in their character, with no connecting or intergrading forms, and their specific characters are borne out by their behavior when hybridized with one another.

The latent life of plants, R. A. Robertson (*Trans. and Proc. Bot. Soc. Edinburgh, 22 (1902), pt. 2, pp. 178–191*).—A discussion is given of the effect of gravity, light and darkness, temperature, contact, injuries, chemicals, etc., on plant activity.

Further experiments in plant breeding at the experimental farms, W. Saunders (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 8 (1902), IV, pp. 115–123, figs. 6*).—A record is given of plant breeding experiments carried on by the author, in which the results obtained with cross-bred wheats, barleys, oats, peas, apples, and gooseberries are given.

Methods in plant physiology, H. S. Reed (*Reprinted from Jour. Appl. Micros. and Lab. Methods, 6 (1903), Nos. 4–10, pp. 2267–2270, 2317–2320, 2386, 2387, 2428–2430, 2464–2466, 2515–2517, 2569, 2570, figs. 11*).—The author describes a number of simple experiments in geotropism, heliotropism, and other plant motions.

Experiments on peas in water culture, J. Golding (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 1, pp. 1–7, figs. 4*).—An account is given of water cultures designed to investigate the process of the nitrogen fixation in the root tubercles of peas, and especially to confirm the results of Nobbe and Hiltner (E. S. R., 12, p. 113).

The peas were grown in nitrogen-free water cultures, receiving an otherwise complete fertilizer. They were inoculated with water extract from crushed pea tubercles so that plenty of organisms could be introduced to their roots. Duplicate cultures were maintained and different series were provided. In one series the roots were as far as possible covered with water; in the second air was excluded by covering the surface of the water with oil; in the third the tubercles were exposed by raising them out of the liquid, while in others the tubercles were covered and either air or oxygen passed through the culture media.

The growth of the different series is shown by figures and described, the author commenting upon the results. It was found that raising the roots out of the water was an injurious process. The oil on the surface of the water prevented nitrogen assimilation, and as there was also no access of oxygen the plants suffered.

The results of the experiment seem to confirm those of Nobbe and Hiltner. Nitrogen assimilation took place only where the root tubercles were covered with water, but even in this case the growth was much less than where the cultures were supplied with combined nitrogen. In sand cultures the author has found the presence of healthy tubercles on the roots to produce growth equal to or better than plants

given a complete fertilizer, but this was not the case under the conditions of the water cultures.

An ecological comparison of some typical swamp areas, S. M. COULTER (*Missouri Bot. Garden Rpt., 15 (1904), pp. 39–72, pls. 24, maps 3*).—The author presents a study of a number of swamp areas in northern Michigan, in Illinois, and in Arkansas, the intention being to group together the available data preliminary to field work on the part of the writer and others. The different regions are described, the characteristic vegetation, distribution of species, etc., being shown.

Some aspects of desert vegetation, D. T. MACDOUGAL (*Plant World, 6 (1903), No. 11, pp. 249–257, pls. 5, figs. 5*).—This article, which is No. 46 of the Contributions from the New York Botanical Garden, describes some of the more striking features of the prominent types of vegetation occurring in the arid regions of this country and calls attention to phases of their life history which need further investigation.

Some rare moor builders, R. TOLF (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 322–324*).—The 3 species of plants described in this paper are but seldom met with in the flora of Swedish moors: *Grimmia hypnoides, Stereodon imponens,* and *Cetraria nivalis*.—F. W. WOLL.

Aberrant veil remnants in some edible agarics, W. TRELEASE (*Missouri Bot. Garden Rpt., 15 (1904), pp. 83–85, pls. 10*).—Attention is called to the fact that occasionally some species of mushrooms which are known to be edible retain some remnants of veil which would, among inexperienced individuals, result in their being considered as poisonous species.

Concerning the toxicology of Amanita muscaria, E. HARMSEN (*Arch. Exper. Path. u. Pharmakol., 50 (1903), p. 361; abs. in Hyg. Rundschau, 14 (1904), No. 10, pp. 486, 487*).

METEOROLOGY—CLIMATOLOGY.

The climate of the Philippines, J. ALGUÉ (*U. S. Dept. Com. and Labor, Census of the Philippine Islands Bul. 2, 1903, pp. 103, pls. 27, maps 2*).—This is a detailed account based on all available observations. It includes, besides notes on physiography of the islands, soils, vegetation, etc., summaries and discussions relating to temperature, aqueous vapor, and atmospheric movements, including surface winds, higher air currents, and extraordinary air currents (baguios, or cyclones, and thunderstorms).

"While the temperature, as indicated by the thermometer at the sea level, is practically the same throughout the entire area of the archipelago, the topographical features of the different islands, and the longitudinal direction of the mountains and hills with reference to the prevailing winds, have a marked effect on the amount of rainfall as well as on the duration of the rainy season. Therefore, while in provinces like Rizal, Batangas, Tayabas, and Bulacan there is a rainy season and a dry season, whose limits can be fairly well defined, there are other provinces, like Albay, Samar, and Surigao, where it usually rains at short intervals throughout the entire year, and where, as a consequence, the climate is more especially adapted to the cultivation of certain important crops than in other provinces.

"The prevalence of typhoons, or, as they are called in the Philippines, 'baguios,' during the summer months, frequently with disastrous results to the shipping, has always been the cause of much apprehension to the owners of vessels and to shippers, but with the establishment of the meteorological department of the Manila observatory in 1865, and the systematic study of these storms, which was commenced by Father Faura, S. J., at that time, and carried on in later years by Father Algué, S. J., the laws governing their origin and movement have been so fully established that their progress, duration, and intensity can now be predicted with great accuracy, and timely notice of their approach be given wherever there is a telegraph station. . . .

"It is sufficient to say here that all important ports in the Philippine Islands now have weather observers who are in telegraphic communication with the central weather bureau in Manila, to which daily reports of the state of the thermometer, barometer, and the direction and force of the wind are telegraphed.

"The cable communication recently established with Guam, not far from which typhoons originating in the Pacific are supposed to form, will add greatly to the accuracy of the predictions and will admit of far earlier and more timely notice of the phenomena which precede and attend their formation and movement."

Climatic charts of the United States (*U. S. Dept. Agr., Weather Bureau Doc. 301, charts 26*).—These include 6 Washington daily weather maps 16½ by 22½ in., for February 1 to 6, 1903, inclusive, showing the movement of a typical storm, with full explanation of symbols, etc.; 5 charts of normal precipitation, quarterly and annual, for the period from 1871 to 1895, inclusive; 3 charts of normal sunshine, January, July, and annual, for the period from 1871 to 1895, inclusive; 3 charts of normal barometric pressure, reduced to sea level, January, July, and annual, for the period from 1873 to 1899, inclusive; 3 charts of normal temperature of the air at the surface of the earth, January, July, and annual, for the period from 1871 to 1895, inclusive; and 6 charts of temperature, showing the mean maximum and the mean minimum temperatures of the air at the surface of the earth in January and July during the period from 1871 to 1901, inclusive, and the highest and lowest temperatures ever observed at the Weather Bureau stations.

Monthly Weather Review (*Mo. Weather Rev., 32 (1904), Nos. 1, pp. 1–50, figs. 11, charts 12; 2, pp. 51–104, figs. 18, charts 12; 3, pp. 105–158, figs. 9, charts 11*).—In addition to the usual reports on forecasts, warnings, weather, and crop conditions, meteorological tables and charts for the months of January, February, and March, 1904, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 1.—Special contributions on Problems of the Atmosphere (illus.), by J. Dewar; Tornado at Moundville, Ala. (illus.), by F. P. Chaffee; Arrangement of Lightning Rods (illus.), by W. S. Franklin; A New Nethoscope, by L. Besson; The Earthquake of January 20, 1904, at Washington, D. C., by C. F. Marvin; Lunar Halo of January 30, 1904, by F. L. Odenbach; Studies on the Circulation of the Atmospheres of the Sun and of the Earth—III.—The Problem of the General Circulation of the Atmosphere of the Earth (illus.), by F. H. Bigelow; and notes on meteorology in Servia, the climate of southwestern Idaho, flow of spring water after first killing frost, an old description of American climates, on lightning rods, forest fires in November, 1819, plant life and rainfall, ocean wave at Honolulu, Hawaii, lowest temperature at Franklinville, N. Y., meteor at Marion, Ind., the peculiarities of California northers, our climatological publications, Weather Bureau men as instructors, hurricane of August 14–15, condition of the ocean, and paths of storm centers.

No. 2.—Special contributions on Disposition of Rainfall in the Basin of the Chagres (illus.), by H. L. Abbot; Solar Halo of February 4, 1904, at Milwaukee, Wis. (illus.), by J. W. Schaffer; A Brief Discussion of Conditions Contributing to Freshets in the James River Watershed (illus.), by E. A. Evans; Studies on the Circulation of the Atmospheres of the Sun and of the Earth—IV.—Values of Certain Meteorological Quantities for the Sun (illus.), by F. H. Bigelow; and the Temperature Element of the Climate of Binghamton, N. Y. (illus.), by W. E. Donaldson; and notes on desirability of complete rainfall records.

No. 3.—Special contributions on The Diminution of the Intensity of Solar Radiation during the Years 1902 and 1903 at Warsaw, Poland, Russia, by L. Gorczynski; Origin of American Cold Waves; Destructive Storms in Kentucky, February 7, 1904 (illus.), by H. B. Hersey; Tornado at Meridian, Ill.; Rain at Freezing Temperatures, by E. D. Emigh; Formation of Clouds over Lake Michigan in Winter, by C. H. Lee; Remarkable Meteors, by F. H. Schofield; Precipitation for Twenty-nine Years at

Dodge City, Kans., by E. D. Emigh; Detailed Cloud Observations in Colorado, by J. B. Willsea; Midwinter Weather Conditions in Western Ontario, by A. G. Seyfert; A West Indian Storm, by J. S. Quin; Remarks on Bigelow's Studies on the Circulation of the Atmosphere, by A. Woeikof; The Vertical Component of the Wind (illus.), by M. Dechevrens; A Study of Some Errors of Kite Meteorographs and Observations on Mountains (illus.), by H. H. Clayton; The Transvaal Observatory, by R. T. A. Innes; Climate of Siberia, Korea, and Manchuria, by E. B. Garriott; The Winter of 1903–4, by W. B. Stockman; and notes on wind effects (illus.), Argentine Republic weather service, seismological work, [meteorological] averages by months or by seasons, a Hawaiian Weather Bureau station, uniformity in methods and standards of instruction in meteorology, weather forecasts by local observers, new astrophysical and meteorological observatories, a new mountain observatory, kite ascensions at Kazan, polarization of the light of the sky, the winter of 1903–4 at Thompson, Windham County, Conn., local storm at Portland, Oreg., bright meteor of September 15, 1902, and hypotheses as to the cause of the aurora borealis.

Report of the Meteorological Council (*Rpt. Meteor. Council [Great Britain], 1903, pp. 180, fig. 1, map 1*).—An account of the work of the council during the year ended March 31, 1903, in the lines of ocean meteorology, weather telegraphy and forecasts, climatology, and miscellaneous investigations is given, with statements regarding publications of the council and its library and finances. Information of a miscellaneous character is given in a series of appendixes. The success of 8.30 p. m. forecasts during 1902–3 was, complete 53 per cent, partial 35 per cent. The averages for the preceding 10 years were, complete 55.7 per cent, partial 27.3 per cent.

Meteorological observations, Moscow, Idaho, 1902, J. E. Bonebright (*Idaho Sta. Rpt. 1903, pp. 18–30*).—Daily and monthly summaries are given of observations on temperature, precipitation, pressure, cloudiness, and wind movement.

Report of the meteorologist, N. Helme (*Rhode Island Sta. Rpt. 1903, pp. 275–291*).—This includes general notes on the weather during the year ended June 30, 1903, and a tabulated record of observations at Kingston on temperature, precipitation, cloudiness, and prevailing winds during each month from July, 1902, to June, 1903, inclusive, with a summary for the year ended June 30, 1903. The latter summary is as follows:

Temperature (degrees F.).—Maximum, 90, July 9, and August 4, 1902; minimum, −12, December 9, 1902; mean, 48.3; highest monthly mean, 67, July, 1902; lowest monthly mean, 27.2, December, 1902; highest daily mean, 77.5, July 9, 1902; lowest daily mean, −2, December 9, 1902. *Precipitation* (inches).—Total (rain and melted snow), 59.27; greatest monthly, 9.19, March, 1903; least monthly, 0.70, May, 1903; greatest in 24 consecutive hours, 2.50, April 15, 1903; snowfall—total 45. *Weather.*—Number of clear days, 138; number of fair days, 96; number of cloudy days, 131; number of days on which there was precipitation of 0.01 in. or more, 103. *Prevailing wind,* west.

Meteorological observations, J. Haltner et al. (*Jahrb. St. Gall. Naturw. Gesell., 1901–2, pp. 621–640*).—Summaries are given of observations on pressure, temperature, relative humidity, cloudiness, precipitation, wind movement, etc., during 1902 at a number of stations in St. Gall.

Meteorological observations, J. S. Part et al. (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 4, pp. 147–157*).—Tables give monthly rainfall from 1894 to 1903 in the various districts of Negri Sembilan; daily observations on temperature, rainfall, humidity, and wind movement at Seremban during February, 1904; and abstracts of similar observations during the month of March at Singapore, Penang, Malacca, Perak, Selangor, Negri Sembilan, Pahang, and Muar.

Report on radiation of the international meteorological committee at Southport in 1903, J. Violle (*Ann. Chim. et Phys., 8. ser., 2 (1904), May, pp. 134–*

144).—A review of investigations on methods and apparatus which have been used in isolating and measuring the energy of solar rays.

The movement of temperature and the precession of the equinoxes, J. PÉROCHE (*Rev. Sci.* [*Paris*], *5. ser.*, *1* (*1904*), *No. 19*, *pp. 579–583*).—A discussion of the relation of the alleged change of seasons to the precession of the equinoxes.

The floods of the spring of 1903 in the Mississippi watershed, H. C. FRANKENFIELD (*U. S. Dept. Agr.*, *Weather Bureau Bul. M*, *pp. 63*, *pls. 16*, *figs. 3*, *charts 15*).—This is a detailed account of the causes and history of these floods fully illustrated with maps, charts, reproductions of photographs, etc.

Instructions governing the corn, wheat, cotton, sugar, and rice region service (*U. S. Dept. Agr.*, *Weather Bureau Doc. 304*, *pp. 8*).—The second edition.

WATER—SOILS.

Underground waters of New Jersey. Wells drilled in 1903, G. N. KNAPP (*Rpt. State Geol. New Jersey*, *1903*, *pp. 73–93*, *map 1*, *dgm. 1*).—A brief discussion is given of the physiographic features of the Appalachian, Crystalline Highlands, Piedmont, and Coastal areas of the State and their relation to the artesian water supply. A record is also given of the wells bored during the year.

The water and soil conditions of Grado and the neighboring coast region, A. N. PAPEŽ (*Ztschr. Landw. Versuchsw. Oesterr.*, *7* (*1904*), *No. 3*, *pp. 77–110*).—A number of analyses of waters and soils are reported and discussed with reference to the utilization of the coast sands for agricultural purposes.

Preliminary report on the soils and agricultural conditions of north-central Wisconsin, S. WEIDMAN (*Wisconsin Geol. and Nat. Hist. Survey Bul. 11*, *1903* (*Economic Ser. 7*), *pp. VIII+68*, *pls. 10*).—The area reported on includes Portage, Wood, Clark, Marathon, Taylor, and Lincoln counties, and adjoining portions of Langlade, Price, and Gates, and covers 7,200 square miles. The topics treated are (1) location and general topographic and geologic features, (2) general character and origin of soil and descriptions of the soil formations, and (3) climate and precipitation, history, and agricultural conditions.

"The area is an undulating slope rising gradually from the south and southwest. Its southern border has an elevation of 900 to 1,100 ft. above sea level, and its northern border an elevation of 1,350 to 1,650 ft. The surface is generally plain-like in southern Clark County, in the southern half of Wood, over a large part of southern and central Portage, and throughout a strip of variable width in Marathon along the Wisconsin River as far north as Wausau. A part of central and southwestern Langlade is also a plain. Outside the area of these plains the surface is a rolling country, with gentle slopes along the valleys and broad slopes over the uplands."

The region is well watered. The soils, which are to a large extent the result of glacial action, are classed on the basis of texture in 14 types, which are mapped and described with reference to area, surface features, general character and origin, ground water, forest growth, and crops. They include Wisconsin River sandy soil, Bancroft gravelly sandy loam, Antigo gravelly loam, Amherst sandy loam, Chelsea clay loam, Cary sandy loam, Mentor loamy sand, Kennan clay loam, Harrison sandy gravelly soil, Colby loamy clay, Marathon loam, Mosinee gravelly soil, Ackley gravelly clay, and swamp and marsh soil. "It is believed that the soils of this area contain all the chemical elements necessary for the growth of crops, and that the varying degree of fertility of the different soils is probably due to their texture and the physical conditions surrounding them."

The summary of meteorological observations by the United States Weather Bureau at several places in the area for 1892–1903 shows that the weather conditions are modified appreciably by Lakes Superior and Michigan both as regards temperature and moisture. The temperature is shown to have varied during the period referred

to from −28.2 in January to 99.1° F. in July. The average annual rainfall varied from 27.5 in. at Stevens Point to 33.12 in. at Neillsville. Killing frosts occur occasionally as late as May and June. They do not occur earlier in the fall than in northern Illinois or Iowa.

Note on scale for chemical valuation of soils, V. EDWARDS (*Chem. News, 89 (1904), No. 2317, p. 197*).—The author states that in judging fertility of the soil from a chemical standpoint he "would describe a good soil as containing 0.25 per cent of each of the three essential ingredients, nitrogen, phosphoric acid, and potash; thus, the three added together, 0.75 would equal 100, and from their analysis all soils could be in a manner compared with the 'standard' imaginary one."

Promising methods for the investigation of problems of soil and plant physiology, and some lines of investigation to which they are adapted, F. H. KING (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 171–190*).—The author points out the importance from the standpoint of the relation of soil moisture to crop yield of "a simultaneous study which would reveal quantitatively and qualitatively the character of the solution which the soil moisture represents, both as it exists in the soil under the growing crop and after it has been absorbed and becomes functional in plant growth."

The development of satisfactory rapid methods, mainly volumetric, for this purpose is referred to (see also E. S. R., 15, p. 457) and tests of their reliability in comparison with gravimetric methods in determining the water-soluble salts of type soils and the concentration of plant sap and culture solutions are reported. The results of some preliminary studies by means of the methods on the capillary movement of dissolved salts in mulched and unmulched soils are also reported.

Can plant analysis determine the content of assimilable plant food in soils? M. STAHL-SCHRÖDER (*Jour. Landw., 52 (1904), No. 1–2, pp. 31–92*).—A series of plat experiments made in 1893 and 1894 with oats, on light and heavy soils, with different combinations of fertilizing materials, is reported, with analyses of the grain and roots of the plants from each plat, the object of the experiments being to determine the value of Heinrich's method [a] of root analysis and Atterberg's method of seed analysis as means of determining the assimilable plant food in soils.

The results indicate that the first method is of little or no value and in many cases leads to erroneous conclusions, and that the second method gives results which are not of general application but apply only to the particular climatic and soil conditions of the region in which the experiments are made. The composition of the seed varies considerably with the season and with the character of the soil, but apparently is not appreciably affected by the variety or the time of planting.

The water-soluble plant food of soils, H. SNYDER (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 25–31*).—See E. S. R., 15, p. 543.

Studies on the development and distribution of nitrates and total water-soluble salts in field soils (*Wisconsin Sta. Rpt. 1903, pp. 339–345*).—A summary of investigations during the 10 years ending with 1903. The following articles are included: Soluble Salts in Cultivated Soils, by F. H. King and J. A. Jeffery (E. S. R., 12, p. 28); Soluble Salts in Cultivated Soils, by F. H. King and A. R. Whitson (E. S. R., 13, p. 24); Development and Distribution of Nitrates and Total Soluble Salts in Cultivated Field Soils, by F. H. King and A. R. Whitson (E. S. R., 13, p. 229); Development and Distribution of Nitrates in Cultivated Soils, by F. H. King and A. R. Whitson (E. S. R., 14, p. 231); Influence of the Soil on the Protein Contents of the Crops, by A. R. Whitson, F. J. Wells, and A. Vivian (E. S. R., 14, p. 955).

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[a] Grundlagen zur Beurteilung der Ackerkrume, Wismar, 1882.

Potash of the soil: Its assimilability and the influence of lime on its circulation, C. SCHREIBER (*La potasse du sol: Son absorbabilité.—Influence de la chaux sur sa mise en circulation. Brussels: Imp. l'Auxiliaire Bibliographique, 1903, pp. 32, figs. 10*).—Pot experiments extending over a number of years (1898–1901) with oats on a variety of soils, with and without potash and other fertilizers, are reported. The comparative results are shown in the following table:

Relative decline in yield of oats with different elements lacking in fertilizers.

Year.	Without nitrogen.	Without phosphoric acid.	Without potash.	Without lime.	Without magnesia.
1898	100	100	100	100	100
1899	71	72	29	87	94
1900	57	52	20	88	103
1901	30	47	11	88	81

This table shows that the assimilable potash of the soil was rapidly exhausted by the oat plants.

The application of potash salts increased the yield of both straw and grain. Other experiments are reported which indicate that lime, or better, gypsum has a marked though limited effect in setting free the potash of the soil.

Studies on the improvement of marsh soils (*Wisconsin Sta. Rpt. 1903, pp. 333–338*).—A summary of investigations during the 10 years ending with 1903. The following articles are included: The Treatment of Swamp or Humus Soil, by F. H. King (E. S. R., 9, p. 536; 10, p. 728); The Treatment of Swamp or Humus Soil, by F. H. King and J. A. Jeffery (E. S. R., 12, pp. 32, 36); The Influence of Potash Salts on Black Marsh Soils, by F. H. King and A. R. Whitson (E. S. R., 13, p. 27); Studies on Black Marsh Soil, by F. H. King and A. R. Whitson (E. S. R., 13, p. 931); Experiments on Black Marsh Soil, by A. R. Whitson (E. S. R., 14, p. 949).

Report on the work of the Swedish Moor Culture Association, 1902 (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 333–347*).—The report describes the activities of the association during the year 1902. These come mainly under two headings, investigations of a chemical or botanical nature and experiments in crop production on moor soils, conducted partly on the experiment farms at Flahult and Jönköping, partly on farms in different parts of the country.—F. W. WOLL.

Soil temperatures for the year 1902, J. E. BONEBRIGHT (*Idaho Sta. Rpt. 1903, pp. 31, 32*).—This is a weekly summary of observations on the temperature of the soil at depths of 1, 3, 6, and 9 in., and 1, 2, 3, 4, 5, and 6 ft.

Observations on soil temperatures during the years 1896-1899 at Mustiala Agricultural and Dairy Institute, T. CANNELIN and L. STENBÄCK (*Landtbr. Styr. Meddel., 1903, No. 44, pp. 99–159*).

Formation of nitrous acid in the air confined in arable soil. Nitrification by chemical processes in the soil, F. SESTINI (*Orosi, 27 (1904), pp. 1–9; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 499, II, p. 363*).—The author finds that the formation of nitrous acid in the soil by the oxidizing action of ferric hydroxid is due to oxidation of ammonia, and not of nitrogen of the air as claimed by Bonnema (E. S. R., 14, p. 850).

The formation of nitric acid and nitrification as a chemical process in cultivated soils, F. SESTINI (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 103–112*).—See above.

Recent progress in soil bacteriology, J. BEHRENS (*Mit. Deut. Landw. Gesell., 19 (1904), No. 26, pp. 181–184*).—A brief general summary of investigations.

FERTILIZERS.

Fertilizer trials on Swedish moor soils, 1900–1902, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 6, pp. 396–420, figs. 10; 18 (1904), No. 2, pp. 73–95, figs. 14*).—*Method of applying artificial fertilizers.*—Experiments were conducted during the season of 1902 with Peluschke peas for the purpose of ascertaining the best method of applying artificial fertilizers as to depth of distribution in the ground. The results showed that the phosphoric acid in Thomas phosphate gave a 42 per cent higher yield of green substance when carefully mixed with the soil to a depth of 15 cm. than when the phosphate was simply harrowed in to a depth of 5 cm., which gave the lowest yield. No appreciable difference in yield was obtained with potash salts whether the fertilizers were mixed with a considerable depth of soil or only harrowed in. The artificial fertilizers were in all cases applied in the spring of the experimental season.

On the effect of different nitrogenous fertilizers on moor soils.—The following summary statement shows the average relative effect of different nitrogenous fertilizers on moor soils obtained in experiments which were conducted by the author during the period given. Seven trials were made with oats, 1 with barley, and 2 with spring rye. The amount of nitrogen applied was generally 45 kg. per hectare (40 lbs. per acre), and in some cases 30 kg. (27 lbs. per acre).

Relative effect of nitrogenous fertilizers on moor, sandy, and clayey soils.

Fertilizer.	Moor soil (7 trials).	Sandy soil (2 trials).	Clayey soil (1 trial).
Nitrate of soda	100	100	100
Sulphate of ammonia	93	79	75
Fish guano	71	79	89
Peat-litter poudrette	59	50	57
Barnyard manure	37	22	13

The nitrate produced the highest yields in 8 out of 11 trials, the sulphate produced the highest yields in 3 cases, the poudrette produced least in 1 trial, and the barnyard manure least in 10 trials.

Experiments of the same character with oats and potatoes at Flahult experiment station, 1900–1902, in which the effects of nitrate, sulphate, and fish guano were compared, gave the following average comparative results: Nitrate, 100; sulphate, with oats, 91, with potatoes, 86; fish guano, with oats, 85, with potatoes, 47.

Barnyard manure v. *artificial fertilizers.*—Experiments conducted during 1901–1903 with barnyard manure *v.* artificial fertilizers for oats or pastures on moor soils gave results showing that barnyard manure can not be applied to advantage under these conditions, but should be accompanied with an application of phosphate and potash. On nitrogenous moor soils of the better class the most profitable fertilization was obtained on the plats receiving only phosphate and potash.

On the fertilizer value of ground gabbro and feldspar on moor soils.—The experiments with these materials which are found on the market and sold under the name of "mineral fertilizers" showed that at least for the crops under trial, alsike clover and Peluschke peas, the effect of their application was practically zero.

On the use of different phosphatic fertilizers on moor soils.—Comparisons of superphosphate, Wiborgh phosphate, and Thomas phosphate have been made in experiments conducted under a great variety of conditions and with different crops since 1898. The conclusion was drawn from the results of the earlier series of trials that the citrate-soluble phosphoric acid in Wiborgh and Thomas phosphates has the same fertilizer value when applied on moor soils as the water-soluble and the citrate-soluble acid in superphosphate for the crops on which the fertilizer is applied. The latter experiments gave decided evidence that the action of the soluble phosphoric acid in the 3

phosphatic materials on moor soils may be considered equal, and that the residual effect of the fertilization with Wiborgh and Thomas phosphates was more pronounced than that of superphosphate.

Experiments with different potash salts.—The results of earlier experiments were corroborated, showing that the different potash salts on the market may be considered of equal value for grain crops, legumes, or pastures on moor soils. The potash salt that can be bought at the lowest price per unit of potash is therefore to be preferred, since the cost of freight is of importance in determining the price of the fertilizer in local markets, the 37 per cent potash salt and the muriate being generally preferable. This is especially true in the case of fertilization of potato land. The high-grade salts produced the largest crops of potatoes, and the starch content of the potatoes was 1 to 2 per cent higher in the case of plats to which such salts had been applied than from fertilization with kainit.

On the action of lime and soil amendments on barren moor soils.—Plat experiments were conducted with soil from a piece of moor land which did not normally grow any crops, and which consisted in its upper layer of partially decomposed Eriophorum plants. It is shown that such soils can be made to produce normal crops of oats, peas, etc., through liming, admixture of sand or clay, and proper fertilization with phosphates, potash, and even some nitrogen. Barnyard manure also produced good effects and is of value for the purpose of facilitating the decomposition of the organic matter in the soil. The improvement in the quality and the yields of the crops harvested on plats receiving different treatment was striking.—F. W. WOLL.

Some lessons learned from experiments with fertilizers, W. SAUNDERS (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 105–112*).—A brief general discussion of the fertilizer requirements of plants and a summary account of the experiments with fertilizers made at the experimental farms at Ottawa since 1887.

The so-called statistical method of making field experiments with fertilizers and calculating the results, T. PFEIFFER (*Mitt. Landw. Inst. K. Univ. Breslau, 2 (1904), No. 4, pp. 647–682, fig. 1*).—This is a controversial article replying to one by Dafert (E. S. R., 15, p. 130), which explains the doubtful reliability of field experiments ordinarily conducted by farmers, and the need of greater accuracy in such experiments if they are to yield results of scientific and practical value, reference being made to the author's plan for securing greater interest in this subject by offering a series of premiums (E. S. R., 13, p. 726).

The main portion of the article, however, is devoted to a detailed discussion of the reliability of conclusions based upon averages of the results of a large number of individual experiments—the so-called statistical method advocated by Dafert—the general tenor of this discussion being that more reliable and useful results may be obtained by increasing the accuracy of individual experiments rather than by increasing the number of cooperative experiments as ordinarily made.

Plant food and use of fertilizers, A. L. KNISELY (*Oregon Sta. Bul. 79, pp. 40*).—A popular discussion of this subject, including directions for making fertilizer experiments and preparing mixtures for different crops.

A contribution to the knowledge of metaphosphates, F. WARSCHAUER (*Ztschr. Anorgan. Chem., 36 (1903), pp. 137–200; abs. in Bul. Soc. Chim. Paris, 3. ser., 32 (1904), No. 11, pp. 653–655*).—This article gives a critical historical review of investigations on this subject, and describes the distinctive characteristics of the various modifications of metaphosphoric acid, including monometaphosphates which are uncrystallizable, insoluble salts; trimetaphosphates which are easily crystallizable and soluble, but are not precipitable; tetrametaphosphates which are crystallizable, soluble, and precipitable; and hexametaphosphates which are amorphous compounds, the alkaline salts giving with the salts of the alkaline earths and heavy metals precipitates which are either flocculent or gelatinous. The preparation and chemical behavior of various salts of these acids are discussed.

Investigations on the fertilizing value of dried superphosphates, A. GRÉGOIRE and J. HENDRICK (*Bul. Agr. [Brussels], 20 (1904), No. 2, pp. 185–201, fig. 1*).—Chemical studies and pot experiments with barley to determine the effect of drying superphosphates on their fertilizing value are reported in detail.

The conclusions reached were that the physical changes brought about by the heating were without effect on the fertilizing value of the product; partial dehydration brought about by heating to 165° C. increased the activity of the phosphoric acid to a notable degree; the mixture of soluble calcium salts resulting from heating monocalcium phosphate to 165° C. until it lost 2 molecules of water was as a rule more effective than crystallized monocalcium phosphates; the calcium metaphosphate produced by dehydration of monocalcium phosphate was of no value as a fertilizer; calcium pyrophosphate produced by complete dehydration of bicalcium phosphate is also of no fertilizing value.

A contribution to the study of phosphatic slag, A. GRÉGOIRE and J. HENDRICK (*Bul. Agr. [Brussels], 20 (1904), No. 2, pp. 202–209*).—Ammonium citrate containing per liter 210 gm. citric acid, 43 gm. ammoniacal nitrogen, and 30 gm. of ammonium fluorid dissolved about half as much of the phosphoric acid of Thomas slag as 2 per cent citric acid. Pot experiments with barley indicated that a large part of the phosphoric acid insoluble in the ammonium citrate containing fluorid was readily assimilable by plants.

On the influence of liming on the availability of phosphoric acid in commercial fertilizers, B. SCHULZE (*Fühling's Landw. Ztg., 53 (1904), Nos. 5, pp. 186–188; 6, pp. 216–222; 7, pp. 261–265*).—A series of pot experiments is reported, from which the conclusions are drawn that the phosphoric acid of bone meal produces an effect in soil poor in lime which very closely agrees with that indicated by the solubility in citric acid; liming reduces the effect of water-soluble phosphoric acid least, of citric-acid soluble phosphoric acid more, and of bone phosphoric acid most; the most injurious effect was produced by liming with burnt lime in the spring, the least by applications of calcium carbonate in the fall; the action of the phosphoric acid of bone depends not only upon the form and time of application but also upon the kind of plant, mustard, for example, utilizing it more completely than oats; liming injuriously affects the phosphoric acid of the soil, rendering it less soluble; the acid compounds of the soil are apparently of considerable value in rendering difficultly soluble phosphates available.

On the influence of liming and marling on the yield of vetches, R. ULBRICHT (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 135–146, pl. 1*).—Pot experiments during 1897, 1899, and 1903 are reported. The results show that vetches, like serradella and lupines tested in previous experiments, are injuriously affected by large applications of lime or marl, although not as sensitive as the latter and in some cases actually benefited by small applications of lime or marl.

Concerning the function of sodium when used in nitrate of soda, H. J. WHEELER ET AL. (*Rhode Island Sta. Rpt. 1903, pp. 237–267, pl. 1*).—This article reviews the work of other investigators on the function of sodium as a plant nutrient, and summarizes the work of the authors which has been carried on at the Rhode Island Station for a number of years. The objects and results of this work are briefly summarized as follows:

"The experiments were designed to throw light upon the question whether the frequent greater effectiveness of nitrate of soda as compared with sulphate of ammonia, when employed at such rates that each furnishes like amounts of nitrogen, is due to a direct manurial action of the sodium, as claimed by Wagner and Dorsch, or in part to other causes.

"Other experiments at this station with about 200 varieties of plants have shown conclusively that plant growth is very greatly influenced by the chemical reaction of the soil, or by compounds formed as a result of the reaction, a fact which seems

established beyond question. Many tests of soils, where both nitrate of soda and sulphate of ammonia have been used, have shown that they influence greatly the chemical reaction of the soil. The nitric acid of the nitrate of soda is taken up by plants leaving a basic residue, while on the other hand the ammonia of sulphate of ammonia is changed to nitric acid and utilized by plants, and sulphuric acid is left as a residual product.

"Wagner and Dorsch, citing European experiments in support of their contention that nitrate of soda is frequently more efficacious than sulphate of ammonia by virtue of a direct manurial action of sodium, make no mention of a possible influence of the chemical reaction of the soil as affected by these salts. Indeed, they cite the Rothamsted results in support of their conclusions. It was pointed out, however, several years ago by one of us (H. J. W.) that the inefficiency of sulphate of ammonia at Rothamsted as compared with nitrate of soda was probably due to the resultant difference in the reaction of the soil which lime was shown to be capable of overcoming. In fact, recent experiments with lime at Rothamsted have shown that it corrects the condition, thus fully demonstrating the position taken at this station, and furnishing further evidence in support of the conclusion from our own experiments.

"The results secured here are to the effect that the differences in the yields produced by nitrate of soda and sulphate of ammonia are not attributable, at least, more than to a limited extent, and then perhaps only with a few kinds of plants, to a direct manurial action of the sodium, but often chiefly to the difference in the chemical reaction of the soil which is brought about by the two salts.

"The conclusion reached is further supported by the fact that the greater efficiency of nitrate of soda, as compared with sulphate of ammonia in our own experiments, was not apparently by virtue of the capacity of soda to act as a carrier of nitric acid to the plant."

The influence of the depth of application of straw on the yield, C. von Seelhorst and W. Freckmann (*Jour. Landw., 52 (1904), No. 1–2, pp. 163–171, pls. 6*).—Pot experiments with oats grown on loam and sandy soils with and without aeration and different amounts of water to determine the influence on denitrification of applications of straw or strawy manures, aeration, moisture, and the character of the soil are reported. The results show that when nitrate was applied the deeper the application of straw or strawy manure the greater the denitrification. In the case of loam soil without nitrate applications of straw in the upper half of the soil were the more injurious.

Influence of applications of strawy manures on yield when used in connection with lime and sulphuric acid, C. von Seelhorst and W. Freckmann (*Jour. Landw., 52 (1904), No. 1–2, pp. 172–174, pl. 1*).—A brief account is given of pot experiments with mustard, the results of which show that the use of such materials as lime and sulphuric acid, which hasten the decomposition of the strawy manures, lessen their injurious effect on the yield, although they do not entirely overcome it.

The value of straw ash, E. Herrmann, E. Hotter, and J. Stumpf (*Separate from Oesterr. Landw. Wchnbl., 30 (1904), Nos. 6, 8, 12, 13*).—The fertilizing value of this material is discussed.

Nitrifying organisms, E. Boullanger and L. Massol (*Ann. Inst. Pasteur, 18 (1904), pp. 181–196; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 499, II, p. 361*).—Observations on the behavior of nitrifying organisms in the presence of various carbonates, nitrites, and ammonium salts are reported.

The nitrous organism accommodates itself to all ordinary carbonates, but does not attack hydroxylamin hydrochlorid. The nitric organism oxidizes nearly all nitrites in solutions containing 0.5 to 1 gm. per liter. Nitrification took place in a great variety of ammonia salts tested, but in case of ammonium arsenite, iodid, citrate, and

oxalate only in solutions containing 0.5 to 1 gm. per liter. The nitrous organism appeared to have an incubation period of 6 days, the nitric organism of only 2 days.

Ammonium salts hindered the multiplication of nitric organisms, but did not interfere with the action of those already present. The minimum retarding amount of ammonia was found to be about 2 parts per million. It is thought that the amount of ammonia in soils under ordinary conditions is too small to interfere with the multiplication of nitric organisms.

Analyses of fertilizing substances sent on for free examination, C. A. Goessmann (*Massachusetts Sta. Bul. 95, pp. 18*).—Analyses are reported of miscellaneous materials, including wood ashes, cotton-hull ashes, limekiln ashes, sulphate of ammonia, nitrate of soda, cotton-seed meal, muriate of potash, high grade sulphate of potash, acid phosphate, dissolved boneblack, phosphatic slag, Belgian phosphate, tankage, steamed bone, ground bone, dry ground fish, mill refuse, wool dust, cotton-seed droppings, cotton-seed dust, cocoa shells, lime refuse, waste lime, dried dandelion root, compound fertilizers, peat, muck, meadow mud, silt deposit, and soils. Notes are also given on the valuation of fertilizers, and on taking samples for analysis.

Commercial fertilizers, P. Schweitzer (*Missouri Sta. Bul. 63, pp. 22*).—A report on the registration and inspection of fertilizers in Missouri during the year ended December 31, 1903, including the text of the State fertilizer law approved March 14, 1903, the details of analyses, and advice to farmers regarding the purchase and use of fertilizers.

Inspection of fertilizers in 1903, F. W. Morse (*New Hampshire Sta. Bul. 108, pp. 63–71*).—This bulletin contains a brief statement regarding fertilizer inspection during 1903 in cooperation with the State Board of Agriculture, and reports analyses of wood ashes and miscellaneous fertilizing materials. The text of the State fertilizer law and a schedule of trade values of fertilizing constituents for 1903 are given.

Miscellaneous analyses, B. L. Hartwell, A. W. Bosworth, and J. W. Kellogg (*Rhode Island Sta. Rpt. 1903, pp. 233–236*).—Analyses of dried blood, ammonium sulphate, nitrate of soda, tankage, wool waste, horn meal, hoof meal, acid fish, star fish, dissolved bone, dissolved boneblack, double superphosphate, acid phosphate, raw aluminum phosphate, muriate of potash, sulphate of potash, air-slaked lime, dried distillers' grains, timothy hay, Buffalo horse feed, Buffalo poultry feed, Buffalo creamery feed, mixed feed, cotton-seed meal, and precipitate from sewage tanks.

Commercial fertilizers (*Wisconsin Sta. Rpt. 1903, pp. 307–313*).—This is a brief summary of the work of the station on commercial fertilizers during the period from 1896 to 1903. The following articles are included:

Fertilizer experiments, by F. W. Woll (pp. 307–309).—Fertilizer Experiments with Indian Corn on Marsh Soils (E. S. R., 10, p. 729); Fertilizer Experiments with Sugar Beets on Marsh Soils (E. S. R., 12, p. 46).

Analyses and general discussions of fertilizers, by F. W. Woll (pp. 309–313).—The Maintenance of Soil Fertility: Commercial Fertilizers (E. S. R., 8, p. 212; 9, p. 543); Fertilizing Value of Lake Mud (E. S. R., 9, p. 543); Fertilizers for Lawns (E. S. R., 11, p. 528).

A list of articles on fertilizer inspection is also given, with a brief history of fertilizer inspection in the State and analyses of fertilizers inspected during 1903.

Fertilizers licensed for sale in Wisconsin in 1904, F. W. Woll and G. A. Olson (*Wisconsin Sta. Bul. 113, pp. 3–13, 18, 19*).—This is a report of the results of analyses of 18 samples of fertilizers licensed during 1904, with notes on the sources, nature, purchase, valuation, and use of fertilizers, and the text of the State law.

FIELD CROPS.

Cooperative experiments in agriculture, C. A. Zavitz (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 10–29, map 1*).—A discussion of the organization of the work is presented, and the results for 1903 and in some cases the average results for a series

of years are tabulated and noted. The yields of the leading varieties of roots and forage crops are given in the following table:

Results with the leading varieties of root and forage crops in 1902.

Crop.	Number of tests.	Number of varieties tested.	Leading variety.	Yield per acre.
				Tons.
Mangels	12	3	Sutton Mammoth Long Red	43.68
Sugar beets	12	2	New Danish Improved	27.02
Swedish turnips	3	3	Magnum Bonum	26.01
Parsnips and carrots	4	3	Pearce Imp. Half Long White Carrot	27.70
Fodder corn	2	3	Mastodon Dent	18.20
Millet	4	3	Japanese Barnyard	3.51
Sorghum	1	3	Early Amber Sugar Cane	18.25
Grass peas and vetches	4	3	Common Vetches	9.47
Rape	2	2	Dwarf Bonanza	18.69

In 1903 corn planted in hills gave but a slightly larger yield than corn planted in drills. In the average of 4 years the results show a difference of 1 ton of total crop and one-fifth of a ton of husked ears per acre in favor of planting in hills. The results with fertilizers are summarized in the following table:

Fertilizer experiments with oats, mangels, fodder corn, and Swedish turnips.

Kind of fertilizer.	Fertilizer per acre.	Average yield per acre.					
		Oats. 5 yrs.; 74 tests.	Mangels. 5 yrs.; 41 tests.	Fodder corn.		Swedish turnips.	
				Whole crop. 6 yrs.; 43 tests.	Husked ears. 6 yrs.; 38 tests.	2 yrs.; 5 tests.	1903. 3 tests.
	Lbs.	*Bu.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Nothing	....	38.9	20.6	8.2	2.8	24.1	25.5
Nitrate of soda	160	46.3	26.5	9.7	3.2	28.9	32.1
Muriate of potash	160	43.8	24.6	9.8	3.1	28.6	39.9
Superphosphate	320	43.6	24.2	9.4	3.2	30.3	33.6
Complete fertilizer	213	48.7	25.4	9.6	3.3	32.1	34.9
Cow manure	40,000	....	....	....	....	33.5	38.1

The complete fertilizer application was composed of one-third of the quantity of nitrate of soda, muriate of potash, and superphosphate applied alone. The largest increase of Swedish turnips as compared with the unfertilized land was obtained with the complete fertilizer at a cost of 1.7 cts. per bu., of mangels with nitrate of soda at 2.3 cts. per bu., of oats with complete fertilizer application at 47 cts. per bu., and of fodder corn with muriate of potash $2.87 per ton.

The yields of the best varieties of grain crops are given in the following table:

Leading varieties in cooperative tests with grain crops.

Crop.	Number of tests.	Number of varieties tested.	Leading variety.	Yield per acre.	
				Straw.	Grain.
				Tons.	*Bu.*
Oats	104	3	Siberian	1.63	54.54
Six-rowed barley	32	3	Manshury	1.50	44.95
Hulless barley	18	2	Black Hulless	1.46	24.13
Spring wheat	13	3	Emmer	1.55	45.25
Buckwheat	2	2	Silver Hull	2.00	32.92
Field peas	14	2	Early Britain	1.65	32.59
Field beans	8	2	White Wonder	1.68	29.59
Bug-proof peas	20	2	Egyptian	1.03	16.27
Soy beans	3	2	Early Yellow	1.28	15.11
Corn for grain	16	3	King Philip	....	48.31
Winter wheat	25	3	Imperial Amber	1.61	24.93

The varieties of sweet corn tested and the number of days required for their growth for table use were as follows: Mammoth White Cory, 95 days; Crosby, 111 days; Country Gentleman, 125 days. Crosby appeared to lead in quality. Five varieties of potatoes grown in 227 tests gave the following yields: Empire State, 221.9 bu.; Burpee Extra Early, 172.6 bu.; Early Pinkeye, 164.1 bu.; Early Ohio, 125.2 bu.; Stray Beauty, 118.8 bu. Level culture has given slightly better yields than hilling. The average results for 4 years show that sprinkling seed potatoes with land plaster increased the yield about 9 bu. per acre throughout Ontario.

Culture experiments in 1902–3, A. DAMSEAUX (*Bul. Agr. [Brussels], 20 (1904), No. 1, pp. 34–43*).—The yields per are of the leading varieties of cereals under test in 1903 were as follows: Schlanstedt rye, 34 kg. of grain and 97 kg. of straw; Gros bleu spring wheat, 34 kg. of grain and 76 kg. of straw; Albert barley, 48 kg. of grain and 60 kg. of straw; and Kirsche oats, 45 kg. of grain and 80 kg. of straw.

An experiment was made to determine the influence of lime on the action of superphosphate. Sugar beats which in addition to superphosphate had received 4,000 kg. of lime per hectare developed well, indicating that the efficiency of the superphosphate was not diminished. When 8,000 kg. of lime per hectare was employed the quality of beets was reduced through deformity. It was also shown that barley was more sensitive to a heavy application of lime in connection with superphosphate than oats. The author concludes that where the application of lime is increased the quantity of superphosphate should be increased in proportion to avoid an excess of lime which in many cases renders phosphoric acid insoluble.

The study of the substitution of sodium for potash was made with oats and barley grown in pots. The yield of oats with a complete fertilizer was 12 gm. per pot; with the same application without potash, 6 gm.; with the complete application in which the potash was replaced with an equal quantity of sodium, 16 gm.; with potash alone, 2 gm.; and with sodium alone, 2.5 gm. The corresponding yields of barley were 11, 6, 8.6, 4.4, and 2 gm., respectively.

Among 11 varieties of sugar beets, Elite Kleinwanzleben led with a yield of 43,800 kg. of beets per hectare representing a value of 1,059.96 francs. The highest sugar content, 14.8 per cent, was obtained in Kirsche which variety also ranked high in purity.

Sulphocyanid of potash as a fertilizer interfered with the germination of barley and winter wheat, while the growth of oats seemed to be benefited. Sugar beets also proved very sensitive to this substance. Applying 300 kg. of sulphocyanid of potash and ammonia at planting reduced the yield of sugar beets by 1,800 kg. per hectare; the sugar content, 0.6 per cent; and the quotient of purity by 2.4 as compared with results obtained where an equal quantity had been applied a month earlier. Plats receiving barnyard manure together with nitrate of soda at the time of planting yielded 37,000 kg. of sugar beets per hectare with a sugar content of 14.20 per cent, while those receiving the manure in March and the nitrate at planting or the manure and part of the nitrate in March and the rest of the nitrate at planting yielded 37,400 kg. with 13.70 per cent of sugar and 38,400 kg. with 14.40 per cent of sugar, respectively.

The comparative yields of 6 varieties of fodder beets are reported. In the production of beets, Kirsche stood at the head with a yield of 91,200 kg. per hectare, containing 10.42 per cent of dry matter, while Dauerrunkel, the leading variety in dry matter, containing 14.41 per cent, stood third with a yield of 72,800 kg.

Equal quantities of seed were planted of 17 varieties of potatoes. The leading varieties, mentioned in the order of productiveness, were Professor Maercker, Up-to-date, Excelsior, and President Kruger.

A mixture of corn, vetches, peas, and horse beans produced from 20,000 to 28,000 kg. of green forage per hectare.

Experiments with leguminous plants at Danish State plant experiment stations, 1880-1899, N. P. NIELSEN (*Tidsskr. Landbr. Planteavl, 10 (1904), pp. 159-323*).—Final accounts are given of experiments with red, alsike, and white clover grown from seed of different origin, and also of a large number of comparative trials with kidney vetch, trefoil, alfalfa, and *Lotus tenuifolius*. Most of the experiments have been conducted for a period of 20 years under a great variety of soils and seasons, as, for instance, the red clover experiments, which were conducted on 27 different fields with over 1,000 seed samples of different origin, planted on 2,581 plats.

The average yields of red clover hay for 2 seasons on all fields compared as follows: Early varieties—Silesian, 100; Danish and Russian, 98; Bohemian, Moravian, and American, 95; Hungarian, Steiermark, and Galician, Rhine region and Holland, 88; English, 81; French, 79, and Italian, 25. Medium late varieties—American, 102; English, 99. Late varieties—Danish and Swedish, 116; Norwegian, 114; Russian, 109; Silesian and Galician, 107; American and English, 101. The following comparative data were obtained with alsike clover: Swedish, 100; Rhine region, 98; English, 97; Germany, 91; Canada, 83; North America, 80. In the average for 2 years the relative yields of white clover from seed of different origin stood as follows: Danish, 100; Italy (Lodi clover), 94; Holland, 92; America, 89; Pommern, 86; England, 80; Provstiet, 80; Silesia, 76; Germany, 73.

The seed of different origin and the characteristics of the seed market in the various regions are discussed, and it is shown that American red clover seed has undergone a marked improvement in quality during the 20 years under investigation. Placing the yields from Silesian seed at 100, those from American seed during successive 5-year periods were 81, 91, 95, and 96.

The principal results obtained with leguminous plants are summarized in the following table, the yields being given in hundredweight per Töndeland, or 1.36 acres.

Comparative yields of leguminous plants.

Crop.	Number of fields.	Number of seed samples.	Number of trial plats.	Yields of hay per Töndeland. First year. First cutting.	Second cutting.	Total.	Second year.	Total for both years.
				Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Early Silesian red clover	15	65	100	45.9	31.6	77.5	21.8	99.3
Alsike clover	17	119	170	39.9	13.7	53.6	27.5	81.6
White clover	16	130	173	25.6	8.5	34.1	13.1	47.2
Trefoil	15	36	68	46.5	6.9	53.4	19.1	72.5
Kidney vetch	16	18	22	65.7	4.7	70.4	....	....

Ten fields of alfalfa during 3 years yielded a total of 227.8 cwt. per Töndeland and 9 fields of sand lucern 225.2 cwt. per Töndeland.

Hungarian alfalfa seed produced the largest yields of hay in all trials. French alfalfa seed gave about 80 per cent of the yield obtained from Hungarian seed, while seed of other origin yielded in the following order: German, Italian, American, and Russian. The yields secured from American and Russian seed yielded only one-third to one-half of that obtained from Hungarian seed. Six series of trials were conducted at 2 different stations with red clover or kidney vetch mixed with alfalfa for the purpose of increasing the yields during the first and second year. The results shown in the following table were obtained on 6 different fields for the first 3 comparative trials and on 5 fields for the other tests.

Yields of hay from alfalfa seed sown alone or mixed with red clover or kidney vetch.

Seed sown.	Yields per Töndeland (1.36 acres).				
	First year.	Second year.	Third year.	Total.	Relative yields.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	
25 lbs. alfalfa seed	40.5	82.9	95.9	219.3	100
18 lbs. alfalfa, 6 lbs. red clover	73.5	65.3	58.8	197.6	90
12 lbs. alfalfa, 12 lbs. red clover	73.9	51.3	33.6	158.8	72
25 lbs. alfalfa	33.6	79.8	88.6	202.0	100
25 lbs. sand alfalfa	42.0	77.0	92.0	211.0	104
18 lbs. alfalfa, 6 lbs. red clover	70.5	66.4	50.2	187.1	93
20 lbs. sand alfalfa, 5 lbs. red clover	64.0	53.6	42.5	160.1	79
12 lbs. alfalfa, 12 lbs. red clover	69.9	48.7	29.1	147.7	73
18 lbs. alfalfa, 6 lbs. kidney vetch	43.7	72.1	65.9	181.7	90

The results show conclusively that in the same ratio as the red clover predominated during the first year, the yield is reduced during subsequent years, so that pure alfalfa seed gives about twice as much hay the third year as the mixture with 6 lbs. red clover seed, and about three times as much as the mixture with 12 lbs. of red clover seed.

The importance of well prepared and well kept alfalfa fields is emphasized, and mowing during the first year when the plant is in full bloom and again toward the end of September is recommended.—F. W. WOLL.

Crops grown on moor soils in different parts of Sweden, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 317–320*).—The author collected statistical data from 21 counties of Sweden which show that 77 per cent of the farmers who settled on moorland plantations grow rye, 49 per cent grow barley, 100 per cent oats, 28 per cent potatoes, 43 per cent fodder beets, and 14 per cent ruta-bagas.—F. W. WOLL.

Experimental stations, E. CLIFTON, F. GILLANDERS, ET AL. (*New Zealand Dept. Agr. Rpt. 1903, pp. 337–359, pls. 28*).—A general report on the work of the different experiment stations in New Zealand is given, and brief notes on the results of culture tests with tobacco and potatoes and of fertilizer trials with potatoes, turnips, mangels, and pasture grasses are included. On the Ruakura Farm, top-dressing pastures with 56 lbs. each of kainit and bone dust on fourth-acre plats gave the best results, while the plat receiving 77 lbs. of Thomas superphosphate gave practically the same yield.

Cape barley yielded 53 bu. per acre at the Momohaki Farm. Pioneer and Tartar King oats produced a very heavy crop but were badly affected with rust. The average results for 4 years are in favor of superphosphate as a fertilizer for potatoes. In a potato variety test Findlay Scotia with a yield of 19 tons per acre headed the list. The use of fertilizer shows great increases in the yields of turnips.

List of Philippine agricultural products and fiber plants, F. LAMSON-SCRIBNER (*Philippine Bureau Agr. Bul. 5, pp. 47*).—A list of fruits and vegetables is alphabetically arranged according to the native or local names. Synonyms are recorded and the plants are briefly described. A list of Philippine Island fiber plants is arranged alphabetically by the scientific names. The local or native names, the distribution within the islands, the parts of the plant used, and the different uses are given.

The selection of varieties for special climatic and soil conditions, W. BESELER (*Illus. Landw. Ztg., 24 (1904), No. 14, pp. 145, 146*).—This article discusses the behavior of different varieties of wheat, oats, and rye under varying conditions and presents conclusions based on these data.

It is stated that as plants are products of the soil, varieties are as much influenced by their origin as breeds of animals. Most highly developed varieties of plants from regions having a favorable climate and a rich soil retain their qualities only under

conditions similar to those of their origin. Petkus rye is remarkable in its adaptation to a wide range of conditions, but this is believed to be due to its origin in an unfavorable climate and on a poor soil. The appearance of highly bred varieties of the other grains adaptable to different environments is considered not improbable.

Regions with poor soils and unfavorable climate have relatively few highly developed varieties. Ordinary varieties are not considered profitable, and it is recommended that in each locality the varieties best adapted to the conditions be selected by means of continued tests, and if these varieties are ordinary and undeveloped they should be improved by selection.

Experiments with grain and forage plants, 1899-1903, R. A. Moore (*Wisconsin Sta. Rpt. 1903, pp. 263-283; figs. 2*).—This article summarizes the work with grain and forage plants previously published and noted as follows: Tests of Grains (E. S. R., 12, p. 42; 13, pp. 36, 938); Tests of Forage Plants (E. S. R., 13, pp. 36, 938; 14, p. 957); Tests With Soy Beans (E. S. R., 13, pp. 36, 938); Variety Test With Soy Beans (E. S. R., 14, p. 957); Inoculation Experiment With Soy Beans (E. S. R., 14, p. 957); Tests With Cowpeas (E. S. R., 13, p. 938); Variety Tests With Cowpeas (E. S. R., 14, p. 957); Trials With Russian Vetch (E. S. R., 12, p. 42); Vetch as a Forage Plant (E. S. R., 13, pp. 36, 938; 14, p. 958); Trials With Growing Alfalfa (E. S. R., 13, p. 938); Trials With Growing the Alfalfa for Seed (E. S. R., 14, p. 957); Fall Seeding of Alfalfa (E. S. R., 14, p. 957); Tests With Turkestan Alfalfa (E. S. R., 14, p. 957); Variety Test of Rape, Dwarf Essex *v.* Victoria (E. S. R., 13, p. 36); Rape Sown with Oats (E. S. R., 13, p. 36); Variety Test of Rape, Dwarf Essex *v.* Puget Sound (E. S. R., 13, p. 938); and Rape Sown with Oats (E. S. R., 13, p. 938).

Causes of silage fermentation (*Wisconsin Sta. Rpt. 1903, pp. 243-249*).—This article is a summary of the work on silage fermentation previously published and noted as follows: Causes Operative in the Formation of Silage, by S. M. Babcock and H. L. Russell (E. S. R., 13, p. 37); Causes Operative in the Formation of Silage (2d article), by S. M. Babcock and H. L. Russell (E. S. R., 13, p. 939); Closed Circuit Respiration Apparatus, by S. M. Babcock and H. L. Russell (E. S. R., 13, p. 21); and Influence of Close Packing on Unavoidable Losses in Silage, by F. H. King (E. S. R., 13, p. 940).

Improving the quality of the brewing barley of this country, R. Wahl (*Reprinted from Amer. Brewers' Rev., 18 (1904), Nos. 3, pp. 89-91; 4, pp. 140-148; 5, pp. 190-194*).—These articles discuss at some length the importance of the albumen content of barley to the brewing industry. The author presents his views with reference to American barley, and reviews the opinions of different brewers and investigators at home and abroad.

Analyses of American barleys from different localities are reported. All 6-rowed varieties, excepting those from California, contained over 10 per cent of albumen, ranging from 10.33 per cent in a barley from Wisconsin to 15.16 per cent in one from Minnesota. The average percentage of husk in the 6-rowed varieties examined was about 11.75 per cent, the range being from 10.43 per cent in New York State barley to 14.10 per cent in California barley from the San Joaquin Valley. The measurements of the kernels of the different varieties are also given, and the methods of analyses and of examinations are briefly described. The history of American barley and barley culture is noted.

Chemical composition of beans, R. Bolliger (*Bol. Agr. São Paulo, 5. ser., 1904, No. 3, pp. 125-131*).—The chemical composition of 37 varieties of beans, including soy beans, is reported.

Clover, F. W. Card and A. E. Stene (*Rhode Island Sta. Rpt. 1903, pp. 209-213, figs. 2*).—Preliminary tests with clover were made to determine whether seed produced on acid soil shows increased resistance to soil acidity. Clover seed from different sources were sown in pots on acid soil of different texture and fertility. The results obtained are not considered as carrying much weight, but they seemed to

indicate that a difference in the ability of plants to resist acidity exists, and that in this experiment Mammoth Red Clover grew better on acid soil than medium red clover.

The effect of a lack of potash on clover and timothy, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 365–368; 18 (1904), Nos. 1, pp. 33–44; 2, pp. 96, 97*).—A brief description is given of experiments with a so-called potash fertilizer which was found to consist of ground feldspar. If the increase in yield of green substance on the plat receiving 100 kg. potash in 37 per cent potash salt be placed at 100, the same amount of potash in the fertilizer gave a yield of 7, and twice this amount, a yield of 43. The plants grown on the unfertilized plats or upon those receiving applications of ground feldspar developed very slowly and made a weak growth; a great many yellowish-green specks appeared on the leaves, indicating a partial destruction of the chlorophyll, very likely due to the absence of soluble compounds of potash. Colored and other reproductions of the appearance of the plants at the time of harvesting accompany the report.

The analyses made of the hay harvested on the different plats showed that the potash content of the hay grown on the unfertilized or ground feldspar plats ranged from 0.600 to 0.635 per cent, while that grown on the plats receiving 37 per cent potash salt contained 1.105 per cent. On these same plats the soda content of the hay ranged from 0.140 to 0.245 per cent, as against 0.020 per cent on the potash plats, showing a relation of potash to soda as 100:23 to 39 in one case, and in the other as 100:2. If the amounts of potash applied on the different plats be compared with those contained in the harvested crop, it is shown that only 4.8 to 8.6 per cent of the potash in the feldspar was utilized by the crop, while in the case of the potash fertilizer 92.8 per cent reappeared in the crop harvested.—F. W. WOLL.

Selecting and preparing seed corn, P. G. HOLDEN (*Iowa Sta. Bul. 77, pp. 169–234, figs. 47*).—This bulletin gives directions for the production, storing, and purchase of seed corn; reports results of experiments with corn at the station, and points out at some length, by means of illustrations and discussions, the characteristics to be sought in the selection of kernels, ears, and plants. The following points are considered: Form, size, and type of kernels, shape and size of ears, position and arrangement of kernels on the cob, proportion of corn to cob, barren plants, uniformity in the height of ears upon the stalk, pollination and germination.

The productivity of different ears of corn was compared by planting the most perfect kernels from 102 of the best ears. The records show that there was a variation between the individual ears in yield from 36.06 bu. to 90.56 bu. per acre, in stand from 43 per cent to 96.5 per cent, in broken stalks from 41 to 258 or from 8 per cent to 64 per cent, in barren stalks from 6 to 79 or from 1.5 per cent to 21.5 per cent, and in the number of suckers from 0 to 106 or 21 per cent. These extremes in all cases showed a marked difference in the yield. The 10 best ears averaged 83.71 bu. per acre and the 5 poorest 40.05 bu., while the entire series of 102 ears gave an average yield of 67.09 bu.

Records of corn planter tests presented show that the edge drop planters gave much better results in the number of times 3 kernels were dropped in dropping 500 hills than the planters provided with the common round hole plates.

In a shrinkage experiment begun October 24, the corn under test had lost 12.60 per cent in weight by February 27. Rates of shrinkage were also determined for 7 different varieties. Nashes Early Yellow, which was perfectly matured when the test was begun October 31, showed a shrinkage of 4.93 per cent on January 9, while in immatured Reid, the loss in weight for the same period amounted to 17.49 per cent. The shrinkage in 4 leading varieties of field corn, for 5 months after husking and cribbing, is shown in the following table:

Shrinkage by months in four varieties of corn in the ear.

Date.	Mammoth Red.	Kegley Golden Beauty.	Iowa Silver Mine.	Yellow Farm.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
October 25	0.00	0.00	0.00	0.00
November 25	7.60	6.66	6.54	7.36
December 25	9.12	7.71	8.00	8.52
January 25	11.40	9.82	9.80	10.85
February 25	12.92	11.57	12.09	12.79
March 25	14.82	13.23	13.45	14.72
April 25	20.53	18.24	18.90	19.37
May 25	20.53	18.59	19.27	19.76
June 25	22.05	20.35	20.00	21.31
July 25	22.05	21.40	21.09	21.70

Of 46 varieties of corn from various parts of the State the 10 best gave an average yield of 77.46 bu. per acre and the 10 poorest 27.89 bu. The yields of the entire list ranged from 7.62 bu. to 91.44 bu. per acre. The lower yields were largely due to a poor stand, but some varieties, even with a poor stand, gave comparatively large yields.

The different steps in the selection of seed ears and kernels are described. A score card, with an explanation of points in corn judging, concludes the bulletin.

Sea Island cotton in the United States and the West Indies, D. MORRIS and J. R. BOVELL (*West Indian Bul., 4 (1904), No. 4, pp. 287–374, figs. 7*).—This article is mainly a report on the culture of Sea Island cotton in the United States, and contains largely information obtained and observations made on a visit to the regions where the long staple cotton is grown. The different steps in the culture of the crop are discussed and preparation of the fiber for market and use of the seed are described. Notes on insect pests and plant diseases injurious to cotton are given.

On the influence of manganese salts on flax, Y. FUKUTOME (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 2, pp. 137, 138, pl. 1*).—A joint application of iron and manganese had a marked effect on the growth of flax plants, while each alone, given at the rate of 0.4 gm. per pot of 8 kg. of soil, showed but a small increase in yield over the check test. An application of 0.02 gm. of cobalt nitrate per pot also exerted a stimulating influence.

Maguey in the Philippines, H. T. EDWARDS (*Philippine Bureau Agr., Farmers' Bul. 10, pp. 14*).—A popular bulletin describing the maguey plant, its history and importance, and giving instructions regarding its culture and the treatment of the fiber.

Comparative value of different varieties of mangels, T. REMY (*Illus. Landw. Ztg., 24 (1904), No. 16, pp. 169–172, figs. 12*).—Seventeen varieties were compared and the results obtained in the total yield and in the production of dry matter tabulated. Each variety is briefly described. The Eckendorf variety produced the highest tonnage of beets per acre. Carter half-sugar beet, which stood first in the production of dry matter, ranked thirteenth in the yield of the beets.

Breeding oats resistant to lodging, A. KIRSCHE (*Illus. Landw. Ztg., 24 (904), No. 20, p. 217; Deut. Landw. Presse, 31 (1904), No. 20, p. 171*).—Measurements of the length and strength of internodes of plants from the breeding nursery are given in tables, and methods of obtaining the data are described.

In breeding varieties resistant to lodging, the lower internodes should be strengthened because the greatest strain falls on this part of the stem. The weight of the stem, according to the author, was no indication of its strength, but, in general, strong lower internodes indicated good strength in the rest of the culm. The lower internode should be shortened, but a plant with a short internode should be used for breeding purposes only when the stem shows good strength. In these tests the strength was determined by placing the part of the stem to be tested upon 2 points,

10 cm. apart, and suspending a weight from the middle. The carrying or sustaining capacity of the different internodes is given in grams.

Ten experiments with potatoes, and potato culture in New England, F. W. RANE and H. F. HALL (*New Hampshire Sta. Bul. 111, pp. 109–130, figs. 8*).—The results of a series of fertilizer experiments and of a variety test are reported. Applications of 1,500 lbs. each of Stockbridge potato manure and of home-mixed fertilizer gave practically equal yields but there was a saving of approximately $8.68 per acre in favor of home mixing. Both applications contained 3 per cent of nitrogen, 6 per cent of phosphoric acid, and 10 per cent of potash. The home-mixed application consisted of 150 lbs. of nitrate of soda, 112½ lbs. of sulphate of ammonia, 565½ lbs. of boneblack, and 300 lbs. of muriate of potash. A comparison between the New York and New Jersey home-mixed formula and the New Hampshire formula indicated that the 2 were of about equal value.

A potash test was made to determine how much potash can be used economically. The plat without potash produced a fair crop. The use of 150 lbs. of muriate of potash produced an increase of 30 bu. of marketable potatoes at a cost of about 11 cts. per bu., 300 lbs. increased the yield by 46 bu. at a cost of 14 cts. per bu., and 450 lbs. by 48 bu. at a cost of 20 cts. per bu. The application of 300 lbs. of muriate of potash or 10 per cent of potash in the fertilizer formula is considered best.

Comparative results between applying the commercial fertilizer all in the hill or one-half in the hill and the remainder broadcast showed no material difference. Fifteen cords of barnyard manure per acre increased the yield by 127 bu. of marketable potatoes and where 750 lbs. and 1,500 lbs. of the fertilizer formula were applied with this quantity of manure the yields were increased by 107 bu. and 101 bu. of marketable potatoes respectively. Larger applications of commercial fertilizer did not give as good results. In general, plowing under barnyard manure gave better results than harrowing it in. An experiment in applying the commercial fertilizer above and below the seed resulted in the best yields from applying it above the seed. The results were the same whether the 15 cords of barnyard manure were used in conjunction with the fertilizer or not.

Brief descriptions of 50 varieties of potatoes are given, and notes on modern potato culture are presented. The average comparative yields of a list of varieties are shown in a table.

Variety tests with potatoes, A. RINDELL (*Landtbr. Styr. Meddel., 1903, No. 44, pp. 28, 29*).—The results with 15 varieties showing the yields, starch content, disease-resisting power, and keeping quality are reported.—F. W. WOLL.

On the practical application of manganous chlorid in rice culture, K. ASO (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 2, pp. 131–133*).—Two square plats of 30 square meters each which had not been manured for several years received each 27 kg. of barnyard manure, 15.5 kg. of night soil, 230 gm. of double superphosphate, and 570 gm. of wood ashes. One of the plats received in addition 25 kg. of manganic oxid in the form of manganous chlorid. The use of manganic oxid increased the yield of husked full grains of rice by one-third. A similar result was obtained by Nagaoka, who applied the same amount of manganic oxid in the form of the sulphate.

The stimulating action of manganese upon rice, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 5 (1903), No. 4, pp. 467–472*).—Preliminary experiments having shown that manganese sulphate in small quantities exerted a favorable influence on the development of various plants, it was determined to carry on an experiment with rice under field conditions.

Equal areas of a rice field were marked off and manganese sulphate applied in such quantities that the amount of manganic oxid was equivalent to from 10 to 55 kg. per hectare. The crop was harvested in November, and the yield in grain and straw is shown in tabular form. There was found to be a progressive and decided increase in the plats receiving manganese sulphate, up to the one receiving 25 kg. per hectare,

beyond which there was a gradual falling off of the yields. The author compares the cost and increased yield, from which it appears that an addition was obtained in the crop that was equal to 4 times the cost of the chemical applied.

On the stimulating action of manganese upon rice, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 2, pp. 135, 136*).—Manganese compounds applied the previous year had increased the yield of paddy rice (see above), and this season the residual effects of these applications were observed. The best yield was obtained where manganese sulphate had been applied at a rate which furnished 30 kg. of manganic oxid per hectare, while the yield on the soil which had received 25 kg. was nearly as large. The increase over the soil which had been manured but had received no manganese was 16.9 per cent, while the maximum of increase for the first year was 37 per cent.

Progress of the beet-sugar industry in the United States, C. F. SAYLOR (*Washington: Government Printing Office, 1904, pp. 184*).—Earlier annual reports on the beet-sugar industry have been previously noted (E. S. R., 15, p. 356). This report discusses the development of sugar-beet production and of beet-sugar manufacture in the different States, compares the culture of sugar beets with growing other crops, points out the influence and economic effects of the industry, and gives general cultural directions.

The quality and source of our sugar-beet seed supply is considered, and the results obtained with home-grown beet seed and in germination tests with home and foreign grown seed, made in the Seed Laboratory of the Bureau of Plant Industry of this Department, are given in tables. The duration of the germination tests was in all except 2 cases 6 and 14 days. The home-grown seed excelled in every respect with the exception of Hoerning seed of Improved Kleinwanzlebener, which in the 14-day test produced the greatest number of sprouts.

The average sugar content of 185 beets grown in Washington from seed produced in that State was 20.21 per cent. Other results obtained by the Bureau of Plant Industry in cooperation with several experiment stations are given in the tables below:

Summary of analyses of beets grown at Geneva, N. Y., fall of 1903.

Kind of seed used.	Sugar content.	Purity coefficient.	Yield per acre.	Sugar × purity.	Sugar × purity × yield.
	Per cent.	*Per cent.*	*Tons.*		
German No. 1	17.4	88.1	18.61	15.33	28.53
German No. 2	17.3	86.3	17.48	14.93	26.10
Washington	16.3	84.0	18.10	13.69	24.78
German No. 3	17.1	88.1	15.74	15.06	23.70
Utah	17.1	85.9	15.78	14.69	23.18
California	16.2	85.3	16.29	13.82	22.51
Michigan	15.2	83.2	13.89	12.65	17.57

Summary of analyses of beets grown at Fairfield, Wash., fall of 1903.

Kind of seed used.	Average weight.	Sugar content.	Yield per acre.	Sugar × yield.
	Ounces.	*Per cent.*	*Tons.*	
Utah	24.64	18.20	11.25	20.47
German No. 1	18.51	18.74	9.24	17.32
German No. 3	23.36	17.23	9.90	17.06
California	14.64	19.48	7.13	13.89
Michigan	14.72	19.39	7.04	13.65
Washington	11.80	19.70	5.84	11.50
German No. 2	8.53	19.00	5.80	11.02

German No. 1 and German No. 2 represent selected seed and German No. 3 commercial seed, while the other samples were produced in the States mentioned.

Summary of analyses of beets grown at Holland, Mich.

Kind of seed used.	Area.	Sugar content.	Yield per acre.	Sugar × yield.
	Acres.	*Per cent.*	*Tons.*	
Utah	0.23	16.00	21.70	34.72
Washington	.35	13.40	15.80	21.17
California	.38	15.00	11.00	16.50
Kleinwanzlebener (average for 3 fields)		15.10	11.13	16.82
Michigan	.13	12.50	13.70	17.12
German No. 1	.25	13.10	8.00	10.48
Hoerning (Germany) (average for 2 fields)		13.25	11.50	15.17

The Hoerning and Kleinwanzlebener seed was obtained from commercial lots. The Kleinwanzlebener was compared with the seed from Utah, Washington, and California, and the Hoerning with seed from Michigan and German No. 1.

The factory and farm results reported for 1903 include the climatic conditions prevalent during the season, the tonnage of beets worked in each State, the amount of sugar produced and the features of improvement and general conditions prevalent in each factory district. Statistics of results for the year in a total of 49 factories are tabulated. A series of letters discussing sugar-beet growing are reproduced, and the matter of State bounties is briefly reviewed.

In 1903, 242,576 acres of beets producing an average of 8.418 tons per acre were harvested and the average price per ton was $4.966. The quantity of beets worked was 2,076,494 tons from which 481,209,087 lbs. of sugar were obtained.

Experiments with sugar beets (*Wisconsin Sta. Rpt. 1903, pp. 293–301*).—This article reviews work previously published and noted as follows: Sugar Beet Production: Possibilities for a New Industry in Wisconsin, by W. A. Henry (E. S. R., 9, p. 133); Sugar-Beet Culture in Wisconsin During 1897, by F. W. Woll (E. S. R., 10, p. 39); Sugar-Beet Investigations in Wisconsin During 1898, by F. W. Woll (E. S. R., 11, p. 143); Sugar-Beet Culture in Wisconsin During 1899, by F. W. Woll (E. S. R., 13, p. 44); Experiments in Sugar-Beet Culture During 1900 and 1901, by F. W. Woll and R. H. Shaw (E. S. R., 13, p. 946); and Sugar-Beet Experiments During 1902, by F. W. Woll and R. A. Moore (E. S. R., 14, p. 961).

The results for 1903 show that Kleinwanzleben yielded at the rate of 52,760 lbs. of beets per acre, representing, at an average sugar content of 11.82 per cent, a production of 6,238 lbs. of sugar. A practically perfect stand had been obtained from the use of seed at the rate of 23 lbs. per acre. Subsoiling increased the yield of beets and of sugar only where phosphate and potash or nitrate, phosphate, and potash were applied. It is believed that in these cases the effect of retarding maturity caused by subsoiling was overcome by the use of the fertilizers. As in previous years the fertilizer tests show that on a suitable soil in a good state of fertility, commercial fertilizers are of little benefit and sometimes remain without effect altogether.

On the effect of artificial fertilizers on the quality of sugar beets, M. WEIBULL (*Landtmannen, 14* (*1903*), *No. 38, pp. 601–604*).—A discussion of the results of fertilizer experiments with sugar beets conducted during the season of 1902 (E. S. R., 15, p. 570).—F. W. WOLL.

Sugar-cane experiments in Cuba, E. F. ATKINS (*Agr. News* [*Barbados*], *3* (*1904*), *No. 56, p. 179*).—The tabulated results show that several Barbados seedlings as well as D 95 and Demarara Seedling have given good results. Harvard 208, a Cuban Seedling and a cross between a Crystalline and a Ribbon cane, contained 17.20 per cent sucrose, with a purity of 95.

Sugar-cane experiments in the Leeward Islands, 1902–3, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Expts. Antigua, and St. Kitt's, 1902–3, I, pp. 68*).—This report on experiments with varieties of sugar cane has been noted from another source (E. S. R., 15, p. 577).

Sugar-cane experiments in the Leeward Islands, 1902-3, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Expts. Antigua and St. Kitt's, 1902-3, II, pp. 115; abs. in Imp. Dept. Agr. West Indies, Pamphlet 30, pp. 78*).—The results of an extensive series of fertilizer experiments are tabulated in detail. The series consisted of 36 tests, and each was repeated 8 times with plant canes and 6 times with ratoon canes. The conclusions and recommendations based on the results are briefly summarized as follows:

"Plant canes, when the field in which they have been planted has been properly tilled and manured with pen manure, require no artificial manure. When the soil is in good condition, but it has been found impossible to give the proper dressing of pen manure, then artificial manures may prove remunerative: Under these circumstances it is suggested that either 1½ to 2 cwt. of sulphate of ammonia, or 2 to 2¾ cwt. of nitrate of soda be given in one application. A small additional profit will probably follow from the use of ¾ to 1 cwt. of sulphate of potash together with phosphate, either 1½ to 2 cwt. of basic phosphate, or a similar amount of superphosphate. All of these manures should be given early.

"For ratoon canes nitrogen is very necessary, and this may take the form of 2 to 3 cwt. of nitrate of soda, or 1½ to 2½ cwt. of sulphate of ammonia. Remunerative results will be obtained without the use of potash or phosphate, but a small additional profit may be expected from their use; ¾ cwt. of sulphate of potash, and 1½ to 2 cwt. of either basic phosphate or superphosphate may be employed. It is quite clear, however, that nitrogen, in a rapidly acting form, must be used if good ratoon crops are to be grown."

Dividing the nitrogen into 2 applications proved detrimental, the effect being more marked where both potash and phosphoric acid were given with the first application of nitrogen, and much more so when potash alone in considerable quantities was applied at that time.

A comparison between the tonnage of canes and the pounds of sucrose in the juice is reported for plant canes and ratoons, and the conclusion is drawn that "the same inferences for the guidance of the planter would be arrived at by argument derived from the tonnage of cane as from the weight of sucrose." The kind of commercial fertilizers used seemed to have affected the quantity of the sugar in the cane but slightly. Nitrogen mixed with potash and phosphoric acid showed a slight increase of sucrose per ton of cane and when used alone a slight decrease. There was no indication that phosphoric acid increased the sucrose per ton of cane. In the ratoon canes the variation was somewhat greater than in the plant canes.

The conclusion is drawn "that manures in such quantities as are likely to be used in ordinary practice in the Leeward Islands exert their influence chiefly in altering the weight of cane per acre without profoundly altering the weight of sucrose to the ton of cane."

Report of the agricultural work for 1901-1903, J. P. D'ALBUQUERQUE and J. R. BOVELL (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1901-3, pp. 121*).—The results of fertilizer experiments with sugar cane on different plantations are tabulated in detail and briefly discussed.

At Dodds the best yields were obtained from a plat fertilized at the rate of 30 tons of barnyard manure, 40 lbs. of nitrogen as dried blood, 36.64 lbs. of phosphoric acid as superphosphate of lime, and 60 lbs. of potash as sulphate of potash per acre. This plat produced 34.7 tons of cane per acre, or 10 tons more than the no-nitrogen plat. Basic slag proved more effective than superphosphate of lime. Sixty pounds of potash in the form of the sulphate, applied one-half in January and one-half in June, gave the highest increase of the potash applications. A plat which had received 50 tons of barnyard manure yielded 33 tons of cane per acre, and this result is believed to indicate that this application will maintain the yield without the use of commercial fertilizers.

At Four Square plantation the plats received 27 tons of barnyard manure in November, 1901, before the crop was planted. In addition, different applications of commercial fertilizers were used. The application of nitrogen alone showed no increase in yield, but where 60 lbs. of nitrogen as sulphate of ammonia were applied with 45.8 lbs. of phosphoric acid as basic slag and 100 lbs. of potash, the increase amounted to 2½ tons. Small quantities of nitrogen were unsatisfactory, but the use of from 80 to 100 lbs. per acre gave good results. Phosphatic manures apparently gave a small increase, and in general superphosphate was more effective than basic slag. Liming increased the yield by from 3 to 4½ tons per acre. The use of 25 lbs. of potash as sulphate also gave an increase in yield.

Experiments at Hopewell plantation were conducted with plant canes, first ratoons, and second ratoons. The plant cane received as a general application 27 tons of barnyard manure per acre; first ratoons, 30 tons; and second ratoons, 40 tons. In the plant-cane experiments a complete commercial fertilizer showed an increase of about 6 tons per acre, and nitrogen was the most important constituent in producing this result. In this case basic slag was more effective than superphosphate. The phosphoric acid and nitrogen furnished in the commercial fertilizers applied to the first ratoons caused an increase in yield of from 8 to 10 tons of cane per acre. The phosphatic manures of this test were equally effective. Where no barnyard manure was used phosphoric acid and potash were without effect in the experiments with second ratoons.

A complete application of commercial fertilizers without manure produced a crop of 20 tons per acre. Basic slag remained without effect and superphosphate produced a small increase. Potash in applications up to 75 lbs. per acre caused a large increase in yield. With the application of manure, nitrogen up to 75 or 100 lbs. per acre produced a larger increase, but when the quantity reached 100 lbs. an addition of the potash and phosphoric acid resulted in no further increase. In a series of tests made on 1-acre plats, it appeared that the use of 18.32 lbs. of phosphoric acid as superphosphate and 50 lbs. of potash as sulphate, in addition to 100 lbs. of nitrogen upon the first ratoons, increased the yield about 1½ tons. The use of nitrogen as nitrate of potash showed no gain.

The results of a tillage experiment showed a difference of 2½ tons of canes per acre. Subsoiling and manuring and cultivating in the usual manner gave the best yield. The smallest yield was obtained where the plats were ridged with a disc plow turning under barnyard manure 8 in. deep, the cane planted in rows at the bottom and cultivated with the Diamond cultivator.

The experiments with seedling and other varieties of canes here reported have been noted from another source (E. S. R., 15, p. 671).

Tobacco work in 1903, E. H. Jenkins (*Connecticut State Sta. Rpt. 1903, pt. 5, pp. 440–444*).—A description is given of work in the selection of tobacco seed for the purpose of obtaining a leaf of desirable quality, and at the same time uniform in size, shape, and weight.

An acre under shade was set with plants from 12 different varieties of tobacco seed, comprising 7 of the Sumatra type, 2 of the Cuban, and 1 each of the Connecticut broadleaf, Connecticut Havana, and Kentucky White Burley. The plants most desirable with reference to number, size, and shape of leaves were retained as seed producers, while all others were topped. At the beginning of flowering 2 or 3 of the best plants were selected from each plat, and all precautions were taken to prevent cross pollination, so that the seed produced is entirely the product of the plant upon which it grew. It is believed that these seeds will produce crops much more uniform in character than the corresponding crops of this season, and that the shape and size of the leaf will show some improvement.

Notes on the culture and handling of tobacco (*Bol. Tec. Coltiv. Tabacchi, Scafati [Salerno], 3 (1904), Nos. 1, pp. 54–85; 2, pp. 47–79*).—A series of brief reports

on experimental work with tobacco in different localities in Italy is given. The results of tests of varieties, starting the seed in seed beds, determining the cost of growing the crop and of curing in different ways are noted.

HORTICULTURE.

A continuation of Bulletin No. 74 on onions, also notes on strawberries and varieties of vegetables, G. Cotte (*Oregon Sta. Bul. 77, pp. 16, pls. 5*).—Bulletin No. 74 of the station (E. S. R., 14, p. 1063) presented the results of some experiments in transplanting onions as compared with seed sown in the open field. That work has been continued and further details are given in the present bulletin. The following table shows the relative yields of different varieties of onions when started in a hotbed from seed and transplanted later as compared with the yields obtained from seed sown in the field.

Yield per acre of transplanted and field-sown onions in 1903.

Variety.	Transplanted.	Field sown.	Increase due to transplanting.
	Bushels.	*Bushels.*	*Bushels.*
Sutton Ailsa Craig	992	393	599
Australian Brown	648	525	123
Red Wethersfield	432	263	169
Silver Skin	432	280	152
Yellow Globe	770	485	285

The onions in the above table have been grown on unmanured land and without irrigation. The transplanted onions were sown in boxes on January 22 and transplanted to the open field, without previous pricking out, between March 21 and 25. The seed for the open-field crop was sown in all cases February 28. The table brings out clearly the increased yields obtained with all varieties with the earlier seeding and transplanting.

Brief descriptions are given of each of the varieties in the table and of 3 other varieties not in the test. Descriptive notes are also given on 5 varieties of garden peas, 1 of cucumbers, 2 each of corn and cabbage, and 16 varieties of strawberries. Some practical suggestions on cultural methods accompany the notes on strawberries.

Variety tests with kohl-rabi and carrots, T. Remy (*Illus. Landw. Ztg., 24 (1904), Nos. 26, pp. 291–293; 27, pp. 303, 304, figs. 12*).—The average yield of kohlrabi was 47,500 kg. per hectare, with 5,200 kg. of dry matter. White Altmark Giant ranked first in yield. Among a number of varieties for table use, Yellow Apple led with a yield of 50,100 kg. per hectare. In the test with carrots, Ottersberg Mousetail stood first with a production of 8,220 kg. of dry matter per hectare. Kuepper Rhenish Giant gave the highest yield of carrots. Bertram Red Sudenberg proved a productive table variety.

Selection of garden carrots, Denaiffe (*Jardin, 18 (1904), No. 410, pp. 89, 90, figs. 2*).—Suggestions are given for improving garden carrots by selection. To prevent crossing, fields of carrots should be 600 to 800 meters (120 to 160 rods) apart.

Culture of cauliflower seed in Denmark, G. Nyeland-Brandt (*Jardin, 18 (1904), No. 410, pp. 85, 86, fig. 1*).—An account of Danish methods of growing cauliflower seed. It is stated that 80 per cent of the seed is exported to America.

Report of the horticultural division, F. W. Card and A. E. Stene (*Rhode Island Sta. Rpt. 1903, pp. 199–229, figs. 9*).—This report contains a detailed record of the blooming period of 82 varieties of apples, 7 of cherries, 35 of pears, and 31 of plums for the years 1899–1903; an account of further work to test the effect of nitrogen, potash, and sugar, respectively, upon the color of flowers (E. S. R., 15, p. 151);

work supplemental to that reported during the years 1898 to 1902 on sweet corn selection (E. S. R., 15, p. 151); experiments on the propagation of huckleberries, or blueberries by stem cuttings, root cuttings, and root grafts; crossing experiments with Ilex and with strawberries; and miscellaneous work like the improvement of clover by selection; the use of gasoline as a remedy against enemies of the squash, cucumber, and pumpkin; spraying peaches with Paris green and Bordeaux mixture and various methods of treating posts to increase their durability, all of which are noted elsewhere in this number.

Further work in fertilizing such flowers as phlox, balsam, branching aster, carmine, peach blossom, and 10 weeks' stock with nitrogen potash, or sugar, respectively, resulted in showing no influence whatever for these different materials in intensifying the color of the flowers produced. Since these results agree with those of the previous year it is believed fair to assume "that under ordinary field conditions any reasonable application of nitrate of soda, of muriate of potash, or of sugar will not materially intensify or reduce red color in flowers."

In the sweet corn experiment selection has proceeded along two lines. "In one line seed has been chosen from the lower ear of stalks bearing the largest number of ears; in the other case from the upper ear of stalks bearing the largest number of ears." The results secured in 1902 were in accord with those of previous years, and show that more progress may be expected by selecting seed from the upper ear than from the lower one. The notion, therefore, that to increase the number of ears, one should choose always from the lower one because that is the last one developed, is shown to be erroneous. Further work along this line will therefore be discarded. Whatever further selection may be made will be from upper ears or from well-developed ears only.

The propagating experiments with blueberries were made with the swamp or high-bush blueberry (*Vaccinium corymbosum*). Seeds of this blueberry germinate readily, but growth is very slow. Attempts were therefore made to see if it could not be propagated in the greenhouse by root or stem cuttings or by root grafts. Such material as moss, sand, garden soil, soil taken from about the roots of wild parent plants, and combinations of these were used as materials in which to start the plants. The cuttings formed shoots readily, but in only a few cases did they form roots. In fact, the main difficulty seemed to lie in inducing the formation of roots.

Very promising results were secured with both root grafts and root cuttings where these were started in moss in which soil taken from about the wild plants was mingled and moderate bottom heat used. In all cases better results were secured when the plants were rooted in moss and soil than when rooted in sand and soil. From the results secured in these experiments the author is hopeful that it may be possible to use miscellaneous New England blueberry roots with selected scions for propagating blueberries, and while such stock can not be sold cheap, it may, nevertheless, be produced at a fair price.

The behavior of plants now growing at the station in cultivated ground indicates that while they may be slow in gaining a foothold they grow more rapidly as time goes on, and there seems to be no reason why they should not give good results in garden culture. Attempts to cross *Gaylussacia resinosa* and *Vaccinium corymbosum* failed. In breeding experiments with Ilex, attempts have been made to cross *Ilex verticillata*, the winter berry, with *Ilex glabra*, the ink berry, the purpose being to combine the red fruit of the winter berry with the evergreen foliage of the ink berry. Thus far the different crosses have resulted in failure.

No results of striking importance have yet been secured in the work with strawberry seedlings.

Miscellaneous horticultural work (*Wisconsin Sta. Rpt. 1903, pp. 368–390, fig. 1*).—This is a summary of the following articles, previously published by the station:

Subwatering Greenhouse Benches, by E. S. Goff and F. Cranefield (E. S. R., 9, p. 557; 13, p. 957); Apple Culture, by E. S. Goff (E. S. R., 8, p. 49); Experiments in Irrigation, by E. S. Goff (E. S. R., 8, pp. 310, 696); Effects of the February Freeze of 1899 upon Nurseries and Fruit Plantations in the Northwest, by E. S. Goff (E. S. R., 11, p. 930); Effects of Continued Use of Immature Seed in the Tomato, by E. S. Goff (E. S. R., 13, p. 47); The Effects of Continued use of Immature Seed in Indian Corn, by E. S. Goff (E. S. R., 13, p. 39); The Influence of Heredity upon Vigor in the Potato, by E. S. Goff (E. S. R., 12, p. 43); An Experiment to Determine the Influence on Yield and Size of Fruit, of Pinching the Tips of Growing Shoots of Raspberries, by E. S. Goff and F. Cranefield (E. S. R., 12, p. 51; 13, pp. 51, 953; 14, p. 966); Injurious Insects, by E. S. Goff; Noxious Weeds, by E. S. Goff (E. S. R., 6, p. 145; 11, p. 749); Experiments in the Curing and Culture of Tobacco, by E. S. Goff (E. S. R., 8, pp. 303, 685); Small Fruits in 1898, by E. S. Goff (E. S. R., 11, p. 150); and Is the Ripening Season of a Pistillate Strawberry Affected by the Blooming Period of Its Pollenizer? by E. S. Goff (E. S. R., 10, p. 755).

In addition, a list is given of numerous other papers on horticultural topics published by the station.

The origin of development of fruit buds (*Wisconsin Sta. Rpt. 1903, pp. 360–362*).—This is a summary of the following article, previously published by the station: The Origin of the Early Development of the Flowers in the Cherry, Plum, Apple, and Pear, by E. S. Goff (E. S. R., 12, p. 22; 13, p. 18).

Fruit growing, with a selected list of varieties for New Hampshire, F. W. Rane (*New Hampshire Sta. Bul. 105, pp. 24, figs. 21*).—Popular directions are given in this bulletin for the growing of a number of orchard and small fruits. It is believed that fruit should and can be much more largely grown throughout New Hampshire than it is at the present time. Special attention is given to recommendations of varieties of each of the different fruits. Lists of suitable varieties for planting in the different parts of the State are given for plums, apples, peaches, pears, grapes, cherries, quinces, blackberries, raspberries, currants, gooseberries, and strawberries.

The fruit garden, G. Bunyard and O. Thomas (*London: Country Life; New York: Charles Scribner's Sons, 1904, pp. XIII+507, pls. 9, figs. 62, dgms. 245*).—Very complete directions are given in this work for the culture of all the usual hardy and house fruits grown in Great Britain. Special attention has been given to the matter of pruning, and this phase of the subject is very fully illustrated.

Besides cultural directions, descriptions are given of a large number of varieties of each of the fruits discussed, and outline drawings made. Tomatoes and melons are considered as well as the nursery propagation and management of trees and the construction of fruit houses. Chapters are also given on fruit culture in America, France, and the Channel Islands. That on America was written by H. E. Van Deman, and is an outline survey of the whole field.

Experiments in orchard management in New England, F. W. Rane (*New Hampshire Sta. Bul. 110, pp. 85–106, figs. 6*).—This bulletin discusses in a popular manner methods of orchard culture and management in New England. One method of renovating an old orchard which has been found successful at the station consists in breaking up the soil in spring and, after thoroughly preparing it, planting to dwarf peas or bush beans. By this method the ground is frequently cultivated, the pods pay for the labor, and the crop is turned under early enough so that a cover crop can be planted.

It is believed that the Hitchings method of mulching the orchard by mowing and letting the crop remain on the ground may possess some advantages for New England. One instance is cited in which an orchard of about 10,000 trees is thus cultivated. Among other topics, methods of manuring, pruning, thinning, spraying, picking, and winter protection of orchards are discussed.

New York apples in storage, S. A. BEACH and V. A. CLARK (*New York State Sta. Bul. 248, pp. 83–152, pls. 2*).—An account is given in this bulletin of the natural season of ripening and of the keeping qualities in (1) natural storage, (2) ice storage, and (3) chemical cold storage of a large number of varieties of apples. The work is based on experiments extending through several years at the station in storing station-grown apples in a storage fruit house without artificial refrigeration, on the extensive experience of practical men who have handled fruit for years both in cold storage and in ordinary fruit warehouses, and on cooperative tests with this Department in the storage of apples in chemical cold storage. A summary of the results secured in the latter case has already appeared in a bulletin of this Department (E. S. R., 15, p. 581).

In the experiments at the station the fruit was picked in each case when it had reached suitable condition, and was placed at once in a frame fruit storage house. This house was built with double walls with a partition between. The space between the partition and outer wall was filled with sawdust, while that between the partition and inner wall was kept a dead air space. The temperature of the storage room was regulated, so far as possible, by opening and closing the windows according to outside conditions. A table is given showing the fluctuations in temperature in the storage room in different months during the years 1896–1898, inclusive.

Under those conditions the average life of the different varieties fell as follows: In October—Gracie, Keswick, Parry, and Strode; first half of November—English Pippin, Alexander, Pound Sweet, Chenango, Pomona, and Stump; last half of November—Boskoop, Elgin, Pumpkin Russet, Jersey Sweet, Krimtartar, Haskell, and Longfield; first half of December—Ohio Pippin, Heidorn, Gravenstein, Longworth, and Tufts; last half of December—Haas, Ostrakoff, St. Lawrence, Tobias, Washington Strawberry, Romna, and Ginnie; first half of January—Admirable, Tobias Pippin, Magog, Aucuba, Gideon, and Disharoon; last half of January—Jefferis, McMahon, Stanard, Twenty Ounce, Blenheim, Mother, Wolf River, Fameuse, Crotts, Henniker, Jewett Red, and McIntosh; first half of February—Pomme Grise, Clarke, Victoria, Hurlbut, Kalkidon, Rhodes, Pumpkin Sweet, Barbel, Wealthy, Peter, Jacobs Sweet, Flory, and Fall Pippin; last half of February—Milligen, Pewaukee, Northern Spy, Falix, Brownlee, Greenville, Maiden Blush, Etowah, Cogswell, Grimes, Fall Wine, Landsberg, Jonathan Buler, Celestia, Dickinson, and Borsdorf; first half of March—Sharp, Peach, Hubbardston, Smith Cider, Milden, Tompkins King, Duke of Devonshire, Reinette Pippin, Marigold, Yellow Bellflower, Tolman Sweet, Buckingham, Northwestern Greening, Swenker, Melon, Domine, Dumelow, Rambo, Canada Baldwin, and Ornament; last half of March—Canada Reinette, Esopus Spitzenburg, Farris, Monmouth, Moon, Scott, Red Russet, Golden Russet, Golden Medal, Peck Pleasant, Sutton, Coon, Rhode Island Greening, Washington Royal, Ronk, and Wallace Howard; first half of April—White Pippin, Kansas Greening, Menagère, Holland, Mann, Jonathan, Olive, Swaar, Caux, White Doctor, Ewalt, Salome, Streaked Pippin, Arkansas, Duncan, Kittageskee, and Wallbridge; last half of April—Moore Sweet, Lankford, Yellow Forest, Newtown Spitzenburg, Occident, Ontario, Fallawater, Roxbury, Rome, Lady Sweet, and Vanhoy; first half of May—Kansas Keeper, Gideon Sweet, Cooper Market, Lawver, Chase, Wagener, York Imperial, Newman, Texas, Large Lady, and Baldwin; last half of May—Jones, Edwards, Stark, Kirtland, Ralls, Winesap, Ben Davis, Zurdel, and Nelson; first half of June—Green Newtown, Pifer, Andrews, and Red Canada. The average life of Schodack extended to July 18.

A summary of the experience of practical men on the keeping qualities of apples, as given by the authors, contains the following suggestions: Overgrown fruit does not keep as well as fruit of medium size. Thick-skinned varieties generally keep better than thin-skinned ones. Colored apples keep best if picked when well colored but still firm. With Rhode Island Greening in cold storage, however, the fruit

appears to keep better if picked while still very green and hard. In common storage the general rule holds. Rough handling of the fruit in the barrels and, of course, at any time previous to barreling, is very injurious. Northern Spy is one of the easiest to bruise, while Tolman Sweet and Yellow Bellflower are both very sensitive to rough handling. Only No. 1 fruit should be stored.

The fruit from trees grown in sod attains a higher color and keeps better than when the trees are given clean cultivation. Baldwins, however, grown on sandy or gravelly soil ripen earlier and have a higher color than when grown on clay soil, yet do not keep so well. Fungi on fruit affects its keeping quality injuriously. Affected fruit keeps best in a cold, dry atmosphere; clean fruit, however, keeps best with considerable moisture in the air. With practically all varieties the fruit keeps best if put into cold storage as soon as picked. Hubbardston may color up better if allowed to lie on straw on the ground 2 or 3 weeks. It is considered that while this practice may be desirable with some varieties which soon go into consumption, it injures the keeping quality.

Generally speaking, apples keep much better if the month of October is cool than if warm; and better after a dry season than a wet one. If the season is such that the fruit does not color up well, the result is the same as when the fruit is picked too green. Fruit which ripens unevenly on the trees should be given 2 or more pickings. Cold storage does not lengthen the life of all varieties over common storage to an equal degree. Thus, the season of Fallawater and Grimes in cellar storage, according to one handler, is January; but the season of Fallawater in chemical cold storage is May, a gain of 4 months, while the season of Grimes in chemical cold storage is February, a gain of but 1 month.

"As to the difference in season of varieties in cellar and in chemical cold storage, Howes makes this uniformly 60 days, i. e., 2 months for all varieties. Newhall makes it 1 month for 5 (early fall) varieties, 2 months for 19 varieties, 3 months for 23 varieties, 4 months for 8 varieties, and 5 months for Northwestern Greening. Graham makes this difference variously from $\frac{5}{6}$ month to 3 months. Hart makes this difference 2 months in a large majority of cases, with extremes of 1 and 4 months. . . .

"As to the relative efficiency of cellar and ice storage as applied to different varieties, Newhall reports that the season of 19 varieties is prolonged by ice storage 1 month beyond their season in cellar storage, 28 varieties, 2 months; 8 varieties, 3 months; and 2 varieties, 4 months. Graham gives the prolongation of season as from $\frac{1}{3}$ month to $2\frac{1}{2}$ months for the different varieties. Hart reports this difference as 1 month for 7 out of 9 varieties.

"As to the relative efficiency of storage under ice and of chemical cold storage, Newhall assigns the same season in either storage to 14 varieties. In the case of 40 varieties Newhall finds that chemical cold storage lengthens the season by 1 month as compared with cold storage under ice, and in the case of 2 varieties the season is lengthened 2 months. Hart reports 7 varieties as keeping 1 month longer in chemical than in ice storage. Graham assigns to one-half of the varieties he reports on a lengthening of the season by $\frac{1}{2}$ month in chemical storage, but in other cases this difference varies from $\frac{1}{3}$ month to $1\frac{1}{2}$ months.

"Shafer estimates the life of fruit in chemical cold storage as 60 days longer than the same varieties under ice, though in very cool seasons, such as that of 1903, there is, he says, hardly any difference in the keeping quality of the fruit in the two storages."

Tables are given showing in detail the seasons of certain varieties of apples in chemical cold storage, ice storage, and cellar storage, as given by the authorities noted in the above paragraphs.

The general principle which appears to hold in the storage of apples is that "varieties that keep long and go down slowly are held at about 31 to 32° F., while early

ripening varieties and those that do not keep so well are held 1 or 2 degrees higher, that is, at 33 to 34°. . . . The early apple, when held at a low temperature, loses in quality and when it comes out of storage it goes down quicker than if held at the higher temperature. Moreover, some fruit as, for instance, that of the ordinary Twenty Ounce freezes at a higher temperature than does other fruit like the ordinary Baldwin, and for this reason aside from others must be held higher."

Very large specimens of a variety which, as before noted, do not keep as well as medium-sized specimens, are held one degree higher in cold storage by some handlers. Others hold all sizes of the same variety at the same temperature. A table is given which shows in detail the temperatures at which different varieties of apples are held in cold storage by 5 different commercial fruit handlers.

Lists are given of the varieties of apples which are comparatively little affected in keeping quality by differences of season, of varieties liable to scald in storage, varieties especially liable to lose in quality in going down in cold storage, varieties liable to lose in color or to lack improvement in color when kept in cold storage, varieties which lose in firmness in going down in cold storage, varieties liable to become bitter in skin in going down in cold storage, varieties liable to shrivel in going down in storage, varieties liable to become mealy in going down in storage, varieties liable to burst in storage before decaying, varieties which go down gradually and varieties which go down quickly in storage, and the heat endurance of varieties after being picked and before being placed in storage.

The bulletin closes with a final summary for each of 205 varieties of apples, in which are included the results of tests of the keeping quality of apples in natural temperature storage at the station for the seasons 1895–6 to 1898–9, the keeping quality in cold storage as determined in cooperative tests with this Department, and the keeping quality as reported by cold-storage men.

Native plums (*Wisconsin Sta. Rpt. 1903, pp. 354–359*).—This is a summary of the following articles, previously published by the station: The Culture of Native Plums in the Northwest, by E. S. Goff (E. S. R., 10, p. 45), and Native Plums, by E. S. Goff (E. S. R., 13, p. 246).

Observations on the fertilization of peach orchards, E. H. JENKINS (*Connecticut State Sta. Rpt. 1903, pt. 5, pp. 428–431*).—The experiment here reported, on the value of different fertilizers for peaches, was begun in 1896 and is still under way. The general plan and results secured in the experiment up to 1902 have been previously recorded in detail and need not again be noted (E. S. R., 15, p. 475). In the present account the yields secured in 1903 on the different plats are added to the earlier records but conclusions are reserved for the future.

Citrus fruits and their culture, H. H. HUME (*Jacksonville, Fla.: The H. & W. B. Drew Co., 1904, pp. XXII+597, pls. 36, figs. 124*).—This is a very complete treatise on citrus fruits and their culture. It covers the various citrus regions of the United States, but deals more especially with the industry in Florida.

The various parts into which the book is divided treat of the botany, history, and varieties of oranges, lemons, pomelos, kumquats, citrons, and limes; the culture of each of these classes of fruits; diseases and insects affecting, etc. A bibliography of about 40 references is included, and in the appendix a list is given of the members in different cities belonging to the National League of Commission Merchants. Each cultural phase, from the selection and budding of the stocks to the packing and shipment of the fruit, is discussed exhaustively and in addition to the usual subjects treated, chapters are given on pot culture, originating new varieties, judging citrus fruits, frost protection, etc.

In the preparation of the book extensive account has been taken of the citrus literature of the experiment stations, more particularly that of the California and Florida stations, and of the experiences of citrus growers in those States. The book

is a valuable addition to the citrus literature of the country, and should prove especially helpful to citrus-fruit growers in the southern States.

Cultivation of citrus groves, H. H. HUME (*Florida Sta. Bul. 69, pp. 29, figs. 2*).—A discussion of the principles to be observed in the cultivation of citrus fruits in Florida, with accounts by 8 successful Florida citrus-fruit growers of their individual methods of culture. The conservation of soil moisture by cultivation was brought out by analyzing soil from cultivated and uncultivated orchards. The uncultivated soil contained 4.17 per cent of moisture, and the cultivated soil 6.97 per cent. In other words, the cultivated soil was 66.5 per cent more moist than the uncultivated.

Cooperative experiments with small fruits, H. L. HUTT (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 29–36*).—The cooperative testing of small fruits has been carried on for 10 years, and at present involves 1,297 experimenters. A copy is given of a circular which contains information regarding the varieties to be tested, the methods to be employed, and the special points to be observed by the experimenters in different parts of Canada.

Varieties of strawberries and raspberries, W. J. GREEN and C. W. WAID (*Ohio Sta. Bul. 146, pp. 29–40, figs. 15*).—Brief notes are given on each of the 74 varieties of strawberries and 10 varieties of raspberries grown at the station. Of the strawberries, the most satisfactory early varieties were August Luther, Cameron Early, Excelsior, Johnson Early, Thompson Early. Of the midseason varieties special mention is made of Kittie Rice, Marie, Miller, Parson Beauty, Sample, Senator Dunlap, Haverland, Warfield, Pocomoke, Greenville. Well tested or promising late varieties are Yant, Brandywine, Gandy, Lester Lovett, Robbie, Nettie.

For the home garden the following are named because of excellent flavor: August Luther, Marshall, Brunette, Kittie Rice, Nettie, Robbie, Corsican, Granville, Yant. The following prolific varieties are especially suited to near market: August Luther, Kittie Rice, Marie, Parson Beauty, Sample, Haverland. For long shipment and for canning the following are suitable: Warfield, Senator Dunlap, Granville, Gandy, Cardinal, Excelsior, Lyon, Marie, Parson Beauty.

Grape growing for home use, J. C. WHITTEN (*Missouri State Bd. Agr. Mo. Bul., 4 (1904), No. 1, pp. 5–12, figs. 2*).—Popular directions for the culture of grapes in Missouri, with some statistics taken from the United States Census relative to the grape and wine industry in Missouri.

On the failing of vineyards at Montagu, C. MAYER (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 695, 696*).—The author visited Montagu at the request of the public to investigate the cause of the failure and death of large numbers of vineyards. The main cause of death was found to be due to the decay of the principal roots brought about by excessive irrigation extending over a long period of years which compacted the soil at a depth of about 2½ to 3 ft. to an excessive degree.

Foreign import tariffs on fruits and nuts, 1903, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 36, pp. 69*).—The duties levied by foreign countries on fruits and nuts are herein arranged in tabular form, the different countries being considered alphabetically.

Pecan culture for western Texas, E. E. RISIEN (*San Saba, Texas: Author, 1904, pp. 55, pls. 9*).—Special attention is given in this small treatise on pecan culture to the propagation of improved varieties on old stock by budding. In addition, the growing of seedling trees and the transplanting and management in the orchard of pecans are fully described, and many useful hints given on the peculiarities of pecans and on varieties, crossing, enemies, etc.

The commercial value, etc., of the seeds of the Para rubber tree (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 2, pp. 43–48*).—Seeds of the Para rubber tree (*Hevea brasiliensis*) were sent to the Imperial Institute, London, England, for examination as to their constituents and commercial uses.

The report includes the results of the examination of the whole seed, the decorticated seed, and of meal made from the seed. It appears from the analyses given that the kernels constitute about 50 per cent by weight of the whole seed. The sample examined contained 42.3 per cent of oil. The husk and kernel (whole seed) ground together yielded 20 per cent of oil. "The oil obtained from the kernels alone is clear, of a light yellow color, and has an odor somewhat resembling that of linseed oil. It belongs to the class of drying oils, and yields a clear, transparent film when allowed to dry by exposure to air. The husks contain a solid fat, which has a high saponification number and a low iodin value, but since the amount of this solid fat in the husks is very small it makes but little difference to the properties of the oil obtained from kernel and husks ground together."

The oil extracted from the rubber-seed meal was solid instead of liquid, as in the case of the seeds, owing to certain decomposition changes which take place after the seed is crushed and caused by the action of a hydrolytic enzym contained in the seed. The analysis of the meal is as follows: Moisture 9.1, ash 3.53, fiber 3.4, oil 36.1, proteids 18.2, and carbohydrates 29.67 per cent. The meal examined contained a considerable quantity of free fatty acid which would make it unfit for fodder purposes, or for the expression of oil; but it is thought probable that if the oil were expressed from the decorticated seed the residual cake could be used as a feeding material, having a composition very similar to some of the oil-cake feeds now on the market.

Commercial brokers report that the oil could probably be used as a substitute for linseed oil, and would be worth about £20 per ton; while the decorticated seed would be worth £10 to £12 per ton. Para rubber cake would be worth £5.15 to £6.15 per ton if prepared as suggested above.

Preparing "Para rubber" in Ceylon, F. J. HOLLOWAY (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 3, pp. 108–110*).—From the author's account it appears that the rubber prepared on the Kepitigalla Estate in Ceylon brings the highest price of any in the world. A full description is given of the methods of tapping, collecting, and coagulating employed.

The latex is strained into shallow tin pans about 7 in. square by 2 in. deep, and left over night. By morning the rubber is coagulated without the use of any chemicals and most of the water separated from the pure rubber. The characteristic features appear to be the straining of the latex so as to remove every particle of dirt, and the rolling of the chunks of rubber obtained into flat, thin sheets about 8 in. square and $\frac{3}{8}$ in. thick. The thinness of the sheets permits the buyer to see at once that they are free from dirt, hence the higher price.

Rubber-tapping experiments in the Botanic Gardens (*Agr. Bul. Straits and Federated Malay States, 2 (1903), Nos. 2, pp. 44–47; 3, pp. 111–113; 8, pp. 264–266*).—Part of the work here reported has been previously noted (E. S. R., 15, p. 479). Continuing the observations it has been found that, in tapping, all sides of the trunk, practically, flow with equal freedom. Dry weather materially decreases the flow of latex, and in periods of drought it is believed that tapping should cease altogether.

The flow of latex has been found more copious and thicker and, therefore, to produce more rubber if tapped from the base of the tree to about 4 ft. high on the trunk than when tapped higher. The assertion, sometimes made, that by reopening old wounds a larger flow of latex may be secured was not found true in these experiments. The greatly diminished yield obtained when trees were tapped when in bloom, amounting to nearly 50 per cent, leads to the conclusion that on no account should rubber trees be tapped when in flower.

Considerable tabular matter is given, which shows the yield of rubber obtained from trees of various sizes and at different dates.

Rubber from Willughbeia edulis and Urceola esculenta in Burma, W. R. DUNSTAN, S. CARR, and J. W. LEATHER (*Agr. Ledger, 1903, No. 10 (Veg. Prod. Ser., No. 76), pp. 233–238*).—Data are given on the flow of latex from these plants, the

chemical composition of the rubber made from them, and the commercial possibilities of rubber making in connection with them.

Latex of *Willughbeia edulis* proved of a very resinous nature, exhibiting the physical properties neither of gutta-percha nor rubber. That portion which was insoluble in acetone but dissolved by chloroform did not resemble ordinary caoutchouc in appearance or properties, being soft, sticky, and inelastic. It is believed to have little or no commercial value from the standpoint of rubber production. The rubber obtained from *Urceola esculenta* was of fair quality, comparing favorably with that known in the trade as "Tonquin." Extensive tapping experiments, however, showed that only a very small amount of latex could be secured from each creeper, and that the cost of tapping and collecting was so great as to prohibit rubber making from this plant as a commercial industry.

The book of town and window gardening, MRS. F. A. BARDSWELL (*London and New York: John Lane, 1903, pp. 105, pls. 23*).—This book is intended to meet the wants of city and town people who may have but little yard space to give to ornamental plants, or who may desire to grow plants in window boxes. Suggestions are given for the culture of plants on balconies, roofs, in back yards, in small suburban gardens, and on walls.

This is the nineteenth volume in the series of Handbooks of Practical Gardening, edited by H. Roberts, and like most of the preceding, treats the subject from the English standpoint. Those engaged in the encouragement of gardening among the city poor may find useful suggestions in it.

Directions for making window gardens, W. W. TRACY (*U. S. Dept. Agr., Bureau of Plant Industry Pamphlet, Mar. 28, 1904, pp. 8, figs. 8*).—Popular directions for the planting and care of window gardens.

The school garden, L. C. CORBETT (*U. S. Dept. Agr., Bureau of Plant Industry Pamphlet, Feb. 25, 1904, pp. 6, dgms. 2*).—Popular directions for laying out and planting small school gardens.

FORESTRY.

Manual of forestry. II, Sylviculture, W. SCHLICH (*London: Bradbury, Agnew, & Co., Ltd., 1904, 3. ed. rev., pp. VIII+393, figs. 87*).—This volume treats of the formation, regeneration, and care of forests or woods in such a manner as to realize for the proprietor the greatest returns for his investments. The subjects considered are: The foundations of sylviculture, the formation and regeneration of woods, care of woods, and notes on some forest trees.

Under the heading, the foundations of sylviculture, the author considers the relation of climate, soil, and other local factors to forest vegetation, the development of forest trees, character and composition of woods, sylvicultural systems, and methods of treatment. Under the second, the preliminary work for the formation and regeneration of woods, care, etc., the preliminary work necessary for establishing forests is discussed, after which, directions are given for the artificial formation and natural regeneration, formation of mixed woods, and suggestions for making a choice of the different methods described.

Under the topic of care of woods, suggestions are given for the protection of woods while the trees are young, the subsequent treatment to prevent crowding, and for the production of large timber. The volume concludes with sylvicultural notes of 21 species of British forest trees, in which descriptions are given of their characteristics, value for timber, etc.

Effects of weather on tree growth, C. E. HALL (*Trans. and Proc. Bot. Soc. Edinburgh, 22 (1901), pt. 1, pp. 71–88*).—In continuation of previous notes (E. S. R., 12, p. 1048) a description is given of the effects of weather on tree growth. In the previous paper the conclusion arrived at was that rainfall was the most essential factor in the growth of trees.

In the present paper attempts are made to analyze the data published previously, and comparisons are drawn between the growth of different species of trees and the rainfall and temperature. In general it appears that a season of heavy rainfall is accompanied by good growth, and where the rainfall is slight relatively little tree growth is made. From the tables given it appears that rainfall, at least under the conditions of the author's observations, is the most important, temperature and sunshine being accessories.

The effects of a hailstorm on growing timber, H. C. SAMPSON (*Trans. and Proc. Bot. Soc. Edinburgh, 22 (1902), pt. 2, pp. 254–257*).—An account is given of the effect of a heavy hailstorm on various timber crops. The storm occurred in June when the trees were in full leaf and through the loss of leaves, destruction of twigs, etc., there must have been a reduction of the year's growth. Wounds caused by the hailstones were observed on the stems of trees where the young bark was still smooth and no damage was observed on the bark of branches more than 2 in. in diameter.

The coniferous trees seemed to have suffered the least, and wounds formed on the stems were soon covered by an exudation of resin. Among the coniferous trees larch appeared to have suffered most. Scotch pine was damaged to a considerable extent, while spruce seemed the least affected of any. The proportion of the amount of injury to broad-leaved trees was in the order of willows and poplars, ash, sycamore, oak, alder, beech, and birch.

The damage done in the injury to the deciduous trees was reported in the following order, those first mentioned healing quickest: Mountain ash, beech, alder, ash, birch, sycamore, oak, poplars, and willows.

On the influence of various fertilizers on pine and spruce plantings, T. CANNELIN and L. STENBÄCK (*Landtbr. Styr. Meddel., 1903, No. 44, pp. 159–161*).

Forestry, F. W. RANE (*New Hampshire Sta. Bul. 106, pp. 27–43, figs. 9*).—This is a popular bulletin giving an account of forests and forest management, and how to convert waste lands into forests adapted to different uses. The suggestions are designed for the reforesting of worn-out fields, natural pastures, burned-over wood lots, sprout or brush lands, sandy barrens, and low, wet lands.

Advancement in American forestry, E. E. FAVILLE (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 37–42*).—A brief review is given of the forestry situation as shown by census reports, and attention called to some of the conditions as shown by the forests of Michigan, Wisconsin, and Minnesota. The more recent legislation regarding forest reserves, and the work of the Bureau of Forestry of this Department are outlined.

The future of Federal forest reservations, E. A. BOWERS (*Forestry and Irrig., 10 (1904), No. 3, pp. 131–135*).—An outline is given indicating future lines of development of the forest reservations, among the most important of which the author believes will be their educational value. These reservations, scattered through a wide range of latitude and longitude and dealing with widely varying conditions, must furnish accumulating experience and knowledge of forestry that will be put to future use.

A forest policy for Massachusetts, B. E. FERNOW (*Forestry Quart., 2 (1904), No. 2, pp. 49–74*).—In a lecture delivered before the State Board of Agriculture of Massachusetts a review was given of the forestry condition of Massachusetts and an attempt was made to outline a forest policy for the improvement of the conditions existing in that State.

Among the points advocated, as given in the summary of the lecture, were the improvement of the forest-fire laws, the appointment of a State forester, encouragement by financial aid of associations and educational agencies concerned in forestry, the acquisition by the State for forest reserves of stump, brush, and waste lands, the encouragement of towns to acquire town forests, and the encouragement of private

owners to improve their wood lots and plant waste places by furnishing expert advice, plant material at cost, and by the passage of a just tax law.

The Michigan State forest reservation (*Forestry Quart., 2 (1904), No. 2, pp. 75, 76*).—A brief description is given of the forest reserve which has been established in Michigan according to plans provided by the State Forestry Commission and the Bureau of Forestry. This territory covers 17 sections of land, the nature of which is described and the species representing the present tree growth are enumerated.

The south part of Pike's Peak Forest Reserve, J. C. BLUMER (*Forestry and Irrig., 10 (1904), No. 4, pp. 169–174, figs. 3*).—A description is given of a portion of the Pike's Peak Forest Reserve situated in the southern part of Colorado, in which an account is given of the fire conditions, water conservation, and mountain timber. The principal species of trees are the Engelmann spruce, several species of pine, fir, etc. The distribution, rate of growth, and relative value of the different species are indicated.

Natural forest extension, C. W. YODER (*Forestry and Irrig., 10 (1904), No. 4, pp. 184–186*).—An account is given of the tendency of forest trees to encroach upon the prairie of northeastern Kansas. The author traces the steady encroachment of timber belts along various creeks, particular attention being paid to Pony Creek in the western part of Brown County, Kansas.

The forest conditions along this creek are not unlike those found along a number of other streams in the same region and personal observations have extended them along the Missouri River westward. In passing westward there is a gradual restriction in the forest areas and a decrease in the number of species, but the prevalence of young trees along ravines and smaller streams indicates a recent extension of forest area.

The planting of white pine in New England, H. B. KEMPTON (*U. S. Dept. Agr., Bureau of Forestry Bul. 45, pp. 40, pls. 13, figs. 2*).—According to the author, white pine may be advantageously used for planting on watersheds, sand barrens, and seaside dunes, on bare lands and worn-out pastures, on cut-over lands, and on wood lots throughout the United States from Maine to Dakota and south to the Missouri and Ohio rivers, and along the mountains to Alabama and Georgia. A study of the white pine in New England showed the practicability of its planting, not only by States and corporations but by the private landowner as well.

The bulletin reports the results of investigations of 12 artificial plantations, amounting to about 2,500 acres. These embrace pure plantings of white pine and white pine with various mixtures. Measurements were made of 98,995 trees, varying in age from 11 to 48 years. These were made to determine the rate of annual growth for each year from the starting stage. The different plantations are described in detail. The different mixtures used are discussed and the relative value of European larch, oaks, chestnut, Scotch pine, red pine, Norway spruce, and sugar maple for planting with white pine is shown. Directions are given for starting a white pine plantation, including notes on the collecting and storing of the seed, preparation of the seed bed, sowing, and shading, the preparation of the plantation, transplanting, and treatment after planting.

From the figures presented it appears that the first profitable lumbering may be practiced between 35 and 45 years after planting. An estimate is given of the cost and profit of an average 60-acre plantation of white pine on waste pasture land in New England, valuing the land at $4 per acre, the crop to be cut at the end of 40 years from the formation of the seed bed. Based upon present prices and deducting all expenses, it is calculated that the return would be equivalent to $1.15 per acre annually in addition to 4 per cent compound interest on the money invested.

Tree planting on our northern prairies, W. A. BURNAP (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 42–46*).—In a brief account the author gives the results of about 50 years' observations on the prairie region of Iowa during which time the

treeless plain, through the agencies of planting and protection, has been transformed into an apparently wooded region.

Why is tree planting a failure? T. H. DOUGLAS (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 27–31*).—According to the author the reasons for failure in tree planting are unsuitable selection of trees, careless planting, and neglect after planting. In order to avoid failure attention is called to some of the necessary procedures to be followed in the selection, planting, and care of trees.

Present condition of Iowa forests, L. H. PAMMEL (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 53–75*).—A review is given of the previous forest condition of Iowa, contrasting it with the conditions as they exist at the present time.

On account of the importance of tree planting in the State the author suggests a number of species which have proved of value for planting in parts if not all of the State. This list includes white, Austrian, and Black Hills pine, white and Colorado spruce, Douglas fir, hemlock, larch, Eastern red cedar and Western cedar, cottonwood, soft and black maple, box elder, green ash, black walnut, butternut, American elm, bur oak, and honey locust.

Extended notes are given on the value, from the tree planter's standpoint, of the cottonwood, soft maple, walnut, green ash, white and Austrian pine, and the red cedar.

The phenology of our trees, CHARLOTTE M. KING (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 47–53, dgm. 1*).—The writer has brought together scattered records pertaining to the trees of Iowa, the data being a consolidation of records of Iowa trees and shrubs so far as kept to the present time, together with temperature averages which are believed necessary to the proper understanding of the variations shown in the different tables.

Cooperative experiments in forestry, R. D. CRAIG (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 36–40*).—An account is given of efforts that have been made by the author and others to secure cooperative experiments between the Canadian government and various individuals and societies for reforesting portions of that country.

The management and planting of British woodlands, C. E. CURTIS (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 16–49, figs. 6*).—A review is given of the condition of British woodlands, which are said to be in a very unsatisfactory state, and suggestions made as to how their present condition might be profitably improved.

Exotic conifers in Britain, W. SOMERVILLE (*Jour. Bd. Agr. [London], 10 (1903), No. 3, pp. 319–346*).—A translation is given of a paper contributed to the Congress of Forestry Experimental Stations, held at Vienna September, 1903, in which the distribution, forestry characteristics, and growth of a considerable number of exotic species of conifers, most of which are of American origin, are described.

The conversion of home-grown timber, R. ANDERSON (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 50–75, figs. 4*).—According to the author the competition of foreign-sawn timber of standard size at low prices has almost destroyed the demand for home grown. For other uses the demand has been well maintained. The value of timber from different species of trees for special uses is pointed out and suggestions given for the conversion of timber and for the utilization of waste and by-products.

The Philippine forestry service, W. KLEMME (*Forestry and Irrig., 10 (1904), No. 4, pp. 158–162, figs. 4*).—Notes are given on the life and work of the American foresters in the Philippines, describing the climatic conditions under which the work is carried on, the methods of estimating the output, and determining the trees for cutting. According to the author the increased importance of this work is shown by the revenues derived through the Forestry Bureau, which in 1900–1901 amounted to $199,373; in 1901–2, $348,073; and 1902–3, $527,414.

Report on the forest administration of the Central Provinces, 1902–3, B. ROBERTSON, H. A. HOGHTON, E. G. CHESTER, and E. E. FERNANDEZ (*Forest Dept., Cen-*

tral Provinces, India, Rpt. 1902–3, pp. 184).—A report is given of the forest administration of the Northern, Southern, and Berar circles of forest administration of the Central Provinces of India. This includes a classification of forest areas, a report on survey and demarcation of the forests, a progress report on the scientific working of the forests, the operations carried on during the year with special reference to forest products, the financial results, etc.

The total area of forests under government control in these regions amounts to 22,869 sq. miles, of which nearly one-third is systematically protected against fire, grazing, etc. Investigations are being conducted in which certain areas which have small value as forests are to be systematically burned over each year in order to obtain information on the subject of the relative yield of fodder and grazing on burned and unburned areas. Other portions of the forests which are of little value for forest purposes are to be transferred to grazing areas, and grazing in the more valuable forests is to be restricted in order to permit natural reproduction and growth of seedlings.

Progress report of forest administration in the Madras Presidency (*Forest Dept., Madras Presidency, India, Rpt. 1902–3, pp. 163*).—A progress report is given of the forestry administration in the Madras Presidency for the year ending June 30, 1903. During this period a slight reduction in the forest area is noted, the reserved forests and the reserved lands now amounting to 19,455 sq. miles. The results of preliminary investigations in the different districts in which the boundaries of the various forests and reservations were examined are reported upon, together with forest surveys, management of State forests, etc.

Progress report of the forest administration in the lower provinces of Bengal, A. L. McIntire (*Forest Dept., Bengal, India, Rpt. 1902–3, pp. 60*).—This report, which covers the year 1902–3, gives statements regarding the operations in the reserved forest area in which it appears that at present 8.92 per cent of the area of the provinces is now entered on the books of the forest department. Statements are given regarding the areas in the forest settlement, boundary inspections, surveys, management of State forests, including working plans, and the protection of forests from fire, grazing, etc.

Annual report of the conservator of forests, 1902, T. R. Sim (*Natal Agr. Dept. Rpt. 1902, pp. 69–92*).—A description is given of the forests of Natal as observed by the author in the short period that intervened between his appointment as forester and the time for preparation of his report, and a plan for the conservation of the forests is outlined.

The chemistry of the forest, J. B. Weems (*Proc. Iowa Park and Forestry Assoc., 3 (1903), pp. 31–36*).—The author describes the various chemical processes connected with forest growth, beginning with the planting of the seed in the soil. The results of analyses of various commercial parts of trees are given, and attention called to some of the principal products derived from trees aside from lumber, timber, etc.

Treatment designed to add to the durability of posts, F. W. Card and A. E. Stene (*Rhode Island Sta. Rpt. 1903, pp. 226–229, pls. 2*).—A description is given of the preliminary treatment given posts to test the relative efficiency of the different methods for prolonging their durability.

The posts used were green chestnut, and when planted half of the posts were set top end down and the other half bottom end down. In addition one row was set without any treatment. The second row had the ends set in the ground charred by placing them over fire until thoroughly blackened and somewhat burned. The posts of the third row were painted with coal tar. Those of the fourth row were painted in the same manner with hot pine tar. The posts of the fifth row were treated with lime by being set in pits, the bottoms of which were filled with fresh lime on which the posts were set, the spaces being filled with the lime and water

added to cause it to slack. The posts in the sixth row were soaked over night in a solution of iron sulphate and then dipped in limewater, while those of the seventh row were treated with carbolineum, a proprietary wood preservative.

The results of the treatment will be reported from time to time.

SEEDS—WEEDS.

Tests of the vitality of vegetable seeds, E. H. JENKINS (*Connecticut State Sta. Rpt. 1903, pt. 5, pp. 432–439*).—A report is given of the tests of 201 samples of field and garden seeds, which were made during the year covered by this report, and are in continuation of those previously reported (E. S. R., 15, p. 482). The average maximum and minimum vitality of all the different lots of seed are reported in tabular form, after which notes are given on the vitality of onion seed as affected by age. A comparison is given of the vitality of crops of Connecticut grown onion seeds in the years 1894 to 1903, and the sprouting capacity of different varieties of onion seed.

Long distance transportation of seeds, J. C. HARVEY (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 1, pp. 5, 6*).—An account is given of a method of packing seeds of *Castilloa elastica* in which their vitality was retained for more than 100 days.

Fresh seeds were dried and cured for 5 days in the shade, after which they were packed in 6 and 8 oz. tins in powdered charcoal. To every pint of pulverized charcoal was added 1 tablespoonful of water, the charcoal being thoroughly mixed by shaking it through a sieve. The seeds were then packed in tins, adding charcoal so that all the interstices were thoroughly filled, after which the charcoal was heaped up and the top of the can pressed down so as to prevent any shaking. The seed were shipped from Vera Cruz, Mexico, to California, and at the expiration of 115 days were returned and sown, with the result that 60 per cent of the young seedlings developed.

In a similar way seeds of the jack or breadfruit nut (*Artocarpus integrifolia*) were shipped from Burma, 80 per cent of the seeds producing plants.

The Macdonald-Robertson Seed Growers' Association, G. H. CLARK (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 55–58*).—A description is given of the aims and methods of the above seed growers' association, which was organized largely for the improvement of seeds of agricultural plants.

Seed control in Cape Colony, E. A. NOBBS (*Agr. Jour. Cape Good Hope, 24 (1904), No. 5, pp. 617–621*).—A description is given of the facilities provided by the Department of Agriculture of Cape Colony for the systematic analyses of seed. Forms are given of application blanks for testing seed samples, a form of report, and directions for taking samples, charges for making the analyses, etc.

The methods of seed analysis, E. A. NOBBS (*Agr. Jour. Cape Good Hope, 24 (1904), No. 3, pp. 354–361, figs. 4*).—A brief account is given of the methods of seed analysis and a description given of seed testing as carried on in a number of European and American laboratories. Direction is given for the drawing of samples, botanical examination, germination, tests, etc.

Annual report of the central seed-testing laboratory of Aynsome, J. S. REMINGTON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Rpt. 1903, pp. 42*).—A report is given of the seed testing carried on at the central seed-testing laboratory for the period from September 1, 1902, to June 30, 1903, during which time 697 samples of seed were examined.

The rules followed at this station are modeled on those adopted by the German seed control stations and in the main have proved very satisfactory. A synopsis is given of the requirements for seed inspection and the principal investigations are briefly outlined.

The analysis of feeding cakes and meals has been begun by the station and will be reported upon in a separate publication. Detailed reports are given of the results of the different analyses of seeds, the most of which were grasses and leguminous forage plants.

The new seed control station at Vienna, T. VON WEINZIERL (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 5, pp. 391–403, pls. 14*).—An illustrated description is given of the new buildings of the seed control station of Vienna. Notes are also given on the establishment, personnel, and work of the station.

Weeds and their suppression, J. PERCIVAL (*Jour. Bd. Agr. [London], 10 (1904), No. 4, pp. 461–467*).—In a popular article the author calls attention to various methods by which weeds may become distributed, the effect they produce upon agricultural crops, and suggests a number of means for their eradication. These methods include the use of clean seed in sowing, deep plowing, and thorough cultivation where once established, the use of special fertilizers for curing the acidity of soils, etc., and for certain weeds special treatment with herbicides.

Equisetum palustre and its eradication, H. JUHLIN-DANNFELT (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 4, pp. 335–339*).

Weeds on Swedish moor plantations, R. TOLF (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 6, pp. 428–440*).

DISEASES OF PLANTS.

Report of the vegetable pathologist, D. McALPINE (*Jour. Dept. Agr. Victoria, 2 (1903), No. 3, pp. 250–260*).—The material of this report is grouped under the following headings: Experiments, principal diseases of the year, publications, and miscellaneous notes.

Among the experiments reported upon was a test of various materials added to Bordeaux mixture and used for the prevention of diseases of apple and pear. Among those added to the mixture were sulphate of ammonia, sal-ammoniac, saltpeter, and common salt, with a slight difference in favor of common salt at the rate of 1 lb. to 40 gal. of water. There was practically no advantage noticed that could be attributed to the addition of the other chemicals. The copper-soda mixture in which washing soda is substituted for lime of Bordeaux mixture was tested and was found to not give the same adhesiveness as when Bordeaux mixture of the usual formula was used.

Notes are given on the bitter pit of apple, rust in wheat, variety tests of wheat, oats, etc., stinking smut experiments in which seed wheat was treated with a number of substances of which copper sulphate, formalin, and corrosive sublimate gave uniformly good results, etc.

Among the principal diseases reported upon are the early blight of potato, a disease of tubers to which the name "blister" is given, and a sclerotium disease of potatoes. The blister disease seemed to be due to the presence of immense numbers of nematodes. The early blight of potatoes is attributed to *Alternaria solani*, and the sclerotium disease to an imperfectly known fungus.

Brief notes are also given on a disease of cauliflower which arises in the seed bed, root rot of fruit trees, mold of wheat, and tobacco mold. The latter attacks the plants in the seed beds, and the best results so far obtained for the prevention of this disease have followed the treatment of the beds before sowing with a rather strong Bordeaux mixture.

Among the miscellaneous notes reported upon are the destruction of charlock or wild mustard by spraying with copper sulphate solution, the reputed poisonous nature of the black nightshade (*Solanum nigrum*), and notes on the destruction of mistletoe.

Annual report of the consulting botanist, W. CARRUTHERS (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 296–309, figs. 5*).—A report is given of the investigations

carried on by the consulting botanist for the year ending 1903. During this time 154 samples of seed were examined for their purity and germination and a considerable number of diseases of plants, weeds, and poisonous plants reported upon.

Among the plant diseases reported a description is given of a disease of turnips which has proven rather serious in parts of England. This disease was of fungus origin and it is believed to be due to *Phoma napo-brassicæ*, which was first described in 1893 (E. S. R., 6, p. 737). For the prevention of this disease the author suggests the removal and destruction of all affected roots, and on the assumption that the fungus reaches the root through the leaves the foliage should be sprayed with either a solution of copper sulphate or, what is probably better, a rather strong Bordeaux mixture. Miscellaneous notes are given on a number of other diseases.

Diseases of plants cultivated in Connecticut, G. P. CLINTON (*Connecticut State Sta. Rpt. 1903, pt. 4, pp. 279–370, pls. 21*).—The author describes the causes of plant diseases and discusses parasitic fungi of different kinds. Notes on the prevention of diseases, directions for the preparation of fungicides, and descriptions of various kinds of spraying apparatus are given. Following these, notes are given on some of the more specific diseases that have been noticed within the past 2 seasons, the arrangement being by an alphabetical list of the hosts.

Plant diseases in 1901–2, WEISS (*Vrtljschr. Bayer. Landw. Rat., 8 (1903), No. 4, pp. 640–668; Sup., pp. 733–763*).—The occurrence of various plant diseases and injuries due to parasitic organisms, physiological disturbances, and insect attacks are noted, and suggestions are offered for the protection of plants from injury. The notes are arranged according to the host plants.

Plant diseases in Denmark, 1902, E. ROSTRUP (*Tidsskr. Landbr. Planteavl, 10 (1904), pp. 361–379*).—A review is given of the more important diseases of plants observed during the period.

Letters on the diseases of plants, N. A. COBB (*Agr. Gaz. New South Wales, 15 (1904), No. 1, pp. 1–19, pls. 6, figs. 10*).—Notes are given on a number of diseases of plants, among them the brown rot of fruits due to *Monilia fructigena*, a cherry blight due to a Dematium-like fungus, various rusts and smuts of cereals, some diseases of citrus fruits, black spot of apple and pear, etc.

Some unusual fungus diseases in Iowa during the summer of 1903, L. H. PAMMEL (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 144–156, pls. 2*).—Notes are given on a number of fungus diseases of economic plants which are either of quite recent occurrence within the State or which possess some unusual features.

A discussion is given of the relation between climatic conditions and fungus development in which it is shown that many fungus diseases are favored by a combination of climatic conditions while others do not seem to be affected. The downy mildew of the grape is said to be favored by moist, damp weather, while the powdery mildew is favored by drier weather with frequent dews. The mean temperature and precipitation at the Iowa Station are given for a number of years, and accompanying them are brief statements regarding the occurrence of a number of diseases.

Chlorosis of plants: Cause and prevention, A. DEMENTYEV (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 6, pp. 714–733*).—The author critically examined the various hypotheses regarding the cause of chlorosis, and from his observations concludes that in the majority of cases chlorosis is caused by parasites upon the roots of the plants. Beginning usually with the more minute divisions of the roots the parasites lay bare the ends of the vessels, interfering with the normal course of the absorption of the soil solutions.

The author believes that chlorosis develops as follows: Owing to the evaporation of water through the leaves and to the negative pressure thereby produced in the stem of tree-like plants, the salt solutions enter directly from the soil into the vessels of the roots which have been laid open by the parasites. These rise into the leaves where, through evaporation, they attain a high concentration. Under the influence

of the high concentration of these salts the stomata of the leaves close and the gas exchange stops. In consequence of the deficiency of oxygen and carbohydrates no new formation of chlorophyll takes place, while the chlorophyll previously formed is destroyed by the light.

A process thus takes place which is analogous to the turning yellow of the leaves in the fall. If the absorption of the salts by the plant takes place in the normal way no chlorosis is observed, because this absorption proceeds slowly, the plant being provided with appliances which enable it to prevent an excessive concentration of the salts in the leaves. When, on the contrary, the salts directly enter into the plant through the exposed vessels of the roots these appliances prove insufficient and do not function normally.

Experiments by the author showed that solutions moving in the direction of the least resistance first reach that part of the crown which corresponds to the respective root branch. Herein is the explanation of the fact that usually chlorosis appears not on the entire plant, but on certain of its parts corresponding to the injured branches of the roots. The circumstance of the rapid absorption of solutions through exposed vessels of the roots suggests to the author the proposition to utilize this phenomenon for artificial nutrition and watering of fruit trees as well as for combating the enemies of the latter.

Whenever plant parasites or insects are the causes of injuries it is rational, in the opinion of the author, to have recourse to the use of carbon disulphid, as is commonly used for phylloxera.—P. FIREMAN.

Heterœcious rust fungi, H. KLEBAHN (*Die Wirtswechselnden Rostpilze. Berlin: Borntræger Bros., 1904, pp. XXXVII+474; rev. in Nature* [*London*], *69* (*1904*), *No. 1800, pp. 601, 602*).—The author treats of the general aspect and discusses the subject of heterœcism in rust fungi, after which special descriptions are given of the various species in which this phenomenon has been recorded, the biology of each being treated in detail. The various headings of the chapters indicate the scope of the work.

After defining heterœcism and giving a history of the subject, a summary is given of the types of rust fungi involved. The means of distribution, germination, and infection of the various kinds of spores are described and various controverted points in the life history of the fungi are discussed. The author rejects Ericksson's mycoplasma theory (E. S. R., 10, p. 316) as accounting for the wintering and subsequent infection of the various host plants.

The specialization of different rusts to certain host plants is described and attention called to some of the curious methods of infection between the related species. A second part of the work is devoted to species of rusts and their biology. Extended bibliographies are given and the work is completely indexed by species of fungi and by the host plants.

The grain smuts, L. A. MERRILL and B. F. ELIASON (*Utah Sta. Bul. 84, pp. 35–44*).—Compiled notes regarding grain smuts, the information being largely drawn from the publications of this Department and the various experiment stations, and the results of the authors' observations and the occurrence and distribution of smuts throughout the State are given. The efficiency of various fungicides for the treatment of seed is compared and directions given for their use. Based upon the efficiency, ease with which the treatment may be followed, cost of treatment, etc., the use of formalin is recommended.

Treatment of seed grain for the prevention of smut (*Wisconsin Sta. Rpt. 1903, pp. 284–292, figs. 2*).—This consists of abstracts of previous publicatons by R. A. Moore, entitled Treating Seed Oats for the Prevention of Smut (E. S. R., 13, pp. 36, 962; 14, p. 957), Oat Smut Investigations for 1902 (E. S. R., 14, p. 958), Oat Smut in Wisconsin (E. S. R., 13, p. 962), and Prevention of Oat Smut and Potato Scab (E. S. R., 14, p. 978).

The treatment of seed oats for the prevention of smut (*Wisconsin Sta. Rpt. 1903, pp. 363-367*).—Abstracts are given of the following previous publications: The Hot-Water Treatment for the Prevention of Smut in Oats, Wheat, and Barley, by E. S. Goff (E. S. R., 8, p. 240); A Trial of "Ceres Pulver" for the Prevention of Smut in Oats, by E. S. Goff (E. S. R., 10, p. 762); The Prevention of Oat Smut, by E. S. Goff (E. S. R., 13, p. 255); The Influence of Formaldehyde on the Germination of Oats, by F. Cranefield (E. S. R., 13, p. 918); The Influence of Formaldehyde on the Germination of Oats, by F. Cranefield (E. S. R., 14, p. 975), and The Influence on the Growth of Oat Plants and the Yield of Grain Resultant from Treating the Seed with Formaldehyde, by F. Cranefield.

In the last paper enumerated are given the results of experiments in 1903, in which the author studied the influence of treatment on the growth of oat plants and on the yield of straw and grain. Different lots of oats were soaked for 20 minutes in solutions of formaldehyde, as follows: One pint to 10 gal. of water, 1 pt. to 25 gal., 1 pt. to 36 gal., and 1 pt. to 50 gal., the growth of the plants being compared with one lot untreated. As far as the growth was concerned but little difference was noted in the plants of the different lots, except where seed was treated with 1 pt. to 10 gal. of water. In this case considerable injury was done, and as the germination was poor the plants had considerably more room for growth than in the other lots. In testing the effect on yield fortieth-acre plats were used, the seed being treated as above. The only positive injury noted was in the case where the strongest solution was used.

From the experiments reported it appears that while a portion of the seed may be destroyed even when treated with formaldehyde solution as dilute as 1 pt. to 50 gal. of water, under practical field conditions the yield is not appreciably affected by treating seed with a solution as strong as 1 pt. to 36 gal.

The relation between Pleospora and Helminthosporium, H. Diedicke (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 2, pp. 52-59*).—In continuation of the author's experiments (E. S. R., 14, p. 877), a report is given on the relation between certain species of Pleospora and Helminthosporium. It appears from his investigations that *P. trichostoma* occurring on rye is probably not to be associated with any species of Helminthosporium but rather with some species of Alternaria. The conidial stages of *H. teres*, *H. avenæ*, *H. bromi*, *H. gramineum*, and *H. tritici repentis* are associated with the perithecial stages of Pleospora, and they should be properly designated as belonging to that genus.

Clover sickness and its cause, H. T. Güssow (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 376-391, figs. 2*).—The author reviews the various causes which from time to time have been suggested for the condition known as clover sickness. Whether this condition is always due to a parasitic fungi is said to be a matter for further inquiry, but the cause of a disease reported in 1901 in the Rothamsted experiments is said to have undoubtedly been the fungus *Sclerotinia ciborioides*.

Not only is red clover subject to attacks of this fungus but alfalfa, white clover, and other species are affected by it. The author says that in the earlier stages of the disease when the dark spots first appear on the leaf spraying with Bordeaux mixture would modify if not check the progress of the disease.

Potato diseases of India, E. J. Butler (*Agr. Ledger, 1903, No. 4 (Crop Disease and Pest Ser., No. 7), pp. 87-124, figs. 9*).—A description is given of the fungus diseases to which the potato is subject in India, particular attention being given to the potato blight due to *Phytophthora infestans* and a disease to which the name "bangle" blight is given. This latter disease is characterized by the sudden wilting of the green tops, and is first noted by the occurrence of wilted plants here and there throughout the field. The tubers are checked in their growth and the yield is lessened and in many cases the tubers are rotten when dug.

A characteristic of the disease is shown in the blackened ring of fibrovascular

bundles in the tubers and where such potatoes were used for seed a diseased crop usually followed. The cause of this disease is thought to be possibly the same as that described in the United States and elsewhere under the name of *Bacillus solanacearum*. A number of other diseases of less frequent occurrence are briefly described.

The relation of date of digging potatoes to the development of the rot, L. R. Jones and W. J. Morse (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 90–95*).—An account is given of the authors' investigations on the relation between the late blight (*Phytophthora infestans*) and the rotting of potatoes after harvest. This account is based on the investigations which have been hitherto reported (E. S. R., 14, p. 1084; 15, p. 1088).

The brown rot of the Swedish turnip, M. C. Potter (*Jour. Bd. Agr.* [*London*], *10* (*1903*), *No. 3, pp. 314–318, pl. 1*).—A short account is given of the brown rot of Swedish turnips which has been under observation since 1898.

The disease was noticed as beginning in October on roots still growing in the fields and was frequently met with in storage. The disease is unquestionably due to the action of bacteria and is attributed to the same organism as that causing the black rot of turnips and cabbage, *Pseudomonas campestris*. The author has succeeded in producing all stages of the disease on perfectly sound roots by inoculation with pure cultures of the bacteria isolated from naturally decaying roots. This organism of decay appears confined to the Cruciferæ. The author suggests prolonged rotation of crops as a means of preventing serious injury by disease.

The occurrence of this disease in the United States is commented upon and the author believes that the greater immunity observed in England may be due to the system of rotation of crops adopted there, as well as the fact that the summer temperature in England is not so high as it is in this country. It has been shown that a temperature of 80 to 90° F. accompanied by a damp atmosphere particularly favors the development of the bacteria.

Two plant diseases in Hawaii, J. G. Smith (*Hawaii Sta. Press Bul. 9, pp. 6*).—A description is given of the pineapple disease of sugar cane and a disease of coffee called the brown-eyed disease.

The pineapple disease of sugar cane, which is due to *Thielaviopsis ethaceticus*, made its appearance in Hawaii in 1903. The disease exists in a number of forms according to the different parts of the cane plant affected, and when occurring on the young seed cane it frequently injures it to such an extent that there is no germination. It is said that serious outbreaks almost invariably follow the work of some insect pest, either the cane borer or leaf hopper. Although the fungus is truly parasitic, its entrance is much facilitated by the injury caused by the insects.

The disease derives its name, pineapple disease, from the odor of the freshly cut stalks, somewhat resembling that of pineapples. This is said to be due to the formation of acetic ether by the fungus from the saccharin substances within the cane. For the protection of the cane seedlings against this fungus it is recommended that the ends be coated with tar before planting, that care be exercised in selecting seed cane, that they be perfectly sound and healthy, and that all infected stalks left after the cane has been harvested should be gathered and burned.

The coffee disease is due to the fungus *Cercospora coffeicola*. This fungus seems to be rather widely distributed and attacks both the leaves and the fruit. On the leaves it produces round or oval spots of a clear brown on the lower surface and dark brown on the upper, the center of the spots being lighter in color. On the fruit small dark spots appear. These by spreading involve about half of the fruit which soon becomes brown and dried. Considering the nature of this fungus, the author believes that the use of Bordeaux mixture or similar fungicide will hold it in check, and he gives directions for the preparation and application of this and other fungicides.

A bacterial disease of sesame, K. Malkoff (*Centbl. Bakt. u. Par., 2. Abt., 11*

(*1903*), *No. 10–11, pp. 333–336, fig. 1*).—A preliminary note is given of a disease of *Sesamum orientale* which has been recently observed in Bulgaria. From diseased specimens the author has isolated an organism and by means of inoculations has been able to produce the disease within a few days. The occurrence on the host plant is characterized by the wilting of the plants followed by their destruction. The biology of the bacteria is to be studied further.

Report on asparagus rust investigation, R. E. SMITH (*California Sta. Circ. 9, pp. 20, figs. 10*).—A preliminary account is given of investigations on the asparagus rust, the investigations being carried on in cooperation between the station and a number of the leading growers, canners, and handlers of asparagus in the vicinity of San Francisco.

After describing the nature of the disease and its injury the author calls attention to the natural conditions affecting its spread, the susceptibility of varieties to the disease, relation of time of cutting to the disease, effect of spraying, fertilizing the soil, parasites, etc. The marketable asparagus is said not to be directly affected by the rust, and the red spots often seen upon the white surface giving the stalks a rusty appearance have been recently determined as due to an entirely different cause which will be investigated during the coming season. The whole subject of the effect of the rust upon the roots and the winter condition of the rust is receiving attention.

Among the conditions affecting the spread of the disease the author has found that the amount of rust varies directly with the amount of dew, and so long as there is little or no dew there will be no rust. The relation of this fact to asparagus cultivation in California is discussed at considerable length and the effect of winds in drying the fields or spreading the disease is shown. It is recommended that all willows and other heavy-growth plants forming a shelter to the fields should be cut away, and in planting the rows should be laid out and the distance between the plants increased so as to secure as much dryness as possible. Decided differences are noted in the susceptibility of varieties, the Palmetto proving in California, as in the East, one of the most resistant.

In discussing the time of cutting asparagus the author recommends that for the present cutting should be stopped early in June, in order that the plants may obtain as much growth as possible before the appearance of the fungus. Spraying has been found to produce a decided reduction in the amount of rust, but when the expense and difficulty of the treatment are considered it is hardly to be recommended. Keeping the plants in vigorous condition by good cultivation and fertilization seems to give good results and to be practical under local conditions. Clean cultivation is particularly recommended.

The author reports the occurrence of parasitic fungi on the rust, but they appear to have had but little effect in reducing the disease. There has been noticed, however, a mold-like fungus which gives great promise of checking the rust and this will be given further investigation.

Bordeaux spraying for melon blight, E. R. BENNETT (*Connecticut Storrs Sta. Bul. 30, pp. 17–23, figs. 3*).—The results of experiments for the prevention of melon blight by the use of Bordeaux mixture are given. The fungicide was prepared by the 4–4–40 formula and tested to make sure that it was not acid. Seven sprayings were given a plat of cucumbers, comparisons being made with untreated plats. The blight appeared quite severe on the unsprayed plants, while those having been sprayed continued to grow until cold weather.

An account was kept of the cucumbers gathered. From the unsprayed portion 550 were secured, while from the sprayed plat 1,298 pickles from 2 to 2.5 in. in length were gathered. The results from spraying melons were practically the same as from cucumbers. Notes are given on the proper method of making Bordeaux mixture and the time and manner of application.

Muskmelon blight, W. M. MORGAN (*West Virginia Sta. Circ. of Information 2,*

pp. 4).—The muskmelon blight, it is said, has become a serious pest, and the station is planning a series of experiments for controlling the blight not only on muskmelons but also on watermelons. As preliminary to a statement of the results of the experiments, directions are given for checking the spread of the disease by the use of Bordeaux mixture.

Studies of the scab disease of carrots (Rhizoctonia violacea), J. ERIKSSON (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 4, pp. 309–334*).—The author finds that the different varieties of carrots differ to some extent in their susceptibility to Rhizoctonia. The form of the disease experimented with appeared to have the faculty of infecting other plants, both wild and cultivated. This paper is essentially the same as that noted in E. S. R., 15, p. 484.—F. W. WOLL.

Black rot of cabbage (*Wisconsin Sta. Rpt. 1903, pp. 259–262, figs. 2*).—An abstract is given of a previous publication entitled, A Bacterial Rot of Cabbage and Allied Plants, by H. L. Russell (E. S. R., 10, p. 155).

Fungus diseases of fruits in Michigan, B. O. LONGYEAR (*Michigan Sta. Spec. Bul. 25, pp. 68, figs. 42*).—This bulletin is designed as a handbook of the most common and destructive diseases of fruits in Michigan. It is based upon the publications of this Department and bulletins of various experiment stations, with notes on the author's observations.

After briefly describing the causes of the diseases, descriptions are given of a number of the more common forms of parasitic and nonparasitic diseases. Directions are given for the preparation of a number of the better known fungicides, and the bulletin concludes with general recommendations regarding spraying.

Pear blight, W. N. HUTT (*Utah Sta. Bul. 85, pp. 45–52*).—This bulletin gives a résumé of the history and nature of pear blight, together with the treatment of the disease which has been found most successful during the past 2 years at the Utah station. The distribution and history of the pear blight, which is due to *Bacillus amylovorus*, are traced and notes given on the kinds of trees attacked, difference in resistance, and the effect of soils, manures, cultivation, irrigation, and pruning on the development of the blight.

Injury to peach foliage from spraying with Bordeaux mixture and Paris green, F. W. CARD and A. E. STENE (*Rhode Island Sta. Rpt. 1903, pp. 223, 224*).—The results of an accidental application of Bordeaux mixture of ordinary strength to a peach tree are given. The tree lost its leaves, becoming nearly defoliated, but as the application was made early in the season the tree put out new leaves and by midsummer was in an apparently healthy condition.

The other injury reported was through spraying tests made in cooperation with this Department. For this purpose samples of Paris green were furnished containing free arsenious oxid, varying from 2.84 to 8 per cent. The peach trees were sprayed with a mixture of 1 lb. to 250 gal. of water. For a few days no injury could be noted, but after 10 days the trees sprayed with the stronger mixtures lost nearly all their leaves and by midsummer many of the branches were dead. Under general conditions it seems unwise to spray peach trees in leaf with either Paris green containing free arsenious oxid or with Bordeaux mixture of ordinary strength.

A root disease in tea, J. B. CARRUTHERS (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2 (1903), No. 6, pp. 111–122*).—A description is given of the root disease of tea due to the fungus *Rosellinia radiciperda*. The external effects of the fungus are described, as well as the results of culture experiments, the structure and life history of the fungus, and its distribution in Ceylon. The author notes the conditions favorable to the spread of the disease and suggests various means for its prevention. The disease seems to be widely spread and to be increasing throughout the island. Its presence is favored by decaying wood in the soil, and it finds its most successful starting point from the roots of dead trees as well as in buried prunings.

For the prevention of the disease the author recommends the isolation of all

suspected areas by digging trenches about them, the destruction of all dead roots containing the mycelium of the fungus, the opening of the soil in the holes left by the removal of the trees, the thorough draining of all plats where the disease is suspected, and the use of such fertilizers as kainit, iron sulphate, basic slag, lime, etc. It is further suggested that the practice of burying the prunings from the tea trees be discontinued.

Experiments on the treatment of downy mildew, L. Ravaz and A. Bonnet (*Ann. École Nat. Agr. Montpellier, n. ser., 3 (1903), No. 2, pp. 157–168*).—Experiments are reported in which the authors tested the relative efficiency of copper and cadmium as fungicides, the adhesiveness of various fungicides, and the action of copper on the growth of grapes. Bordeaux mixture, cadmium sulphate and lime, a simple solution of cadmium sulphate, and a solution of copper sulphate were compared, and so far as their relative efficiency in checking the downy mildew was concerned there was found but little choice.

In the experiments on adhesiveness, Bordeaux mixture, Burgundy mixture, verdigris solutions, and Bordeaux mixture, to which was added turpentine and resin, were tested. Different lots of grapevines received 1, 2, and 3 sprayings, and the adhesiveness of the different fungicides was determined by the amount of mildew observed on the vines. Where 3 sprayings were given the vines practical immunity was secured with all the fungicides.

Where 2 applications were made, the fungicides, to which resin was added, gave the best results, closely followed by ordinary Bordeaux mixture, Burgundy mixture, and verdigris solutions. Where only a single spraying was given the vines no difference in adhesiveness was noted and but slightly less disease was observed on the treated vines than on those which received no applications of fungicides.

In studying the action of chemicals on the growth of the vines cadmium and copper seemed to have about the same stimulating effect on the foliage of the crop, prolonging their attachment and increasing the intensity of coloration, although copper was found much more active in the latter respect than cadmium.

The wintering of Oidium tuckeri, O. Appel (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 4–5, pp. 143–145, fig. 1*).—It is said that the powdery mildew can vegetate during the winter as isolated fragments of mycelium on the newly formed wood into which it sends its numerous irregular haustoria. In the spring of the year these anomalous strands of mycelium develop into normal growths which bear conidia, thus setting up a new infection of the mildew.

Powdery mildew and grape hybrids, E. Goutay (*Prog. Agr. et Vit. (Ed. L'Est), 24 (1903), No. 47, pp. 608, 609*).—Notes are given on the relative susceptibility of varieties of grapes to injury by the powdery mildew. Some of the newer hybrids are reported as being very susceptible to injury by the fungus, while others are nearly or quite resistant to its attack.

The treatment of the gray rot of grapes and the composition of wines, L. Degrully (*Prog. Agr. et Vit. (Ed. L'Est), 24 (1903), No. 49, pp. 464, 465*).—The results of the application of fungicides for the prevention of gray rot, as shown by the quality of the wine, are given. The vines had been covered with a powdered fungicide, made according to the formula of Sokolnicki, which consists of "alum plaster" 25 kg., cement 10 kg., gypsum 25 kg., and sulpho-steatite 40 kg. This was applied to the vines twice during the season, and under the conditions of the experiment a maximum quantity of plaster, alum, and sulphate of copper was administered to the plants.

The wine made from these plants was subjected to analysis which showed no presence of copper nor was there an excess of potassium sulphate, but the alumina present corresponded to 0.409 gm. per liter, an amount which is about 13 times as great as that tolerated.

On the treatment of the gray rot of grapes, E. Combemale (*Prog. Agr. et Vit. (Ed. L'Est), 24 (1903), No. 50, pp. 697, 698*).—A fungicide consisting of triturated

sulphur 50 kg., mineral superphosphate 25 kg., and copper steatite 25 kg. is recommended as a preventive measure against gray rot of grapes. This has been used for 2 seasons with success and according to the author did not produce any injurious or deleterious effect on the quality of the wine.

The action of silver chlorid on the gray rot of grapes, G. BOUCHARDAT (*Rev. Vit., 20 (1903), No. 521, pp. 669, 670*).—Based upon the investigations of Raulin, which showed that ammoniacal solutions of silver chlorid had a strong fungicidal action, the author reports upon this substance when used for attacks of *Botrytis cinerea*.

To prepare this solution the author dissolved 25 gm. of silver nitrate in 200 gm. of water to which was added sufficient sea salt to precipitate the silver nitrate in the form of chlorid. After precipitation strong ammonia was added sufficient to completely dissolve the precipitate, and 1 liter of the solution was made by the addition of water. When used 10 cc. of this solution was added to 12 to 15 liters of water and sprayed upon the vines.

The vines sprayed with this solution were protected against the attack of the fungus until after the second invasion, which was very light on both sprayed and check vines.

The canker fungus in rubber, J. B. CARRUTHERS (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 12, pp. 389–392*).—An account is given of the canker fungus of rubber, which is said to have been first noticed in 1901 by the Conservator of Forests, but was not called to the author's attention until early in 1903.

The disease is due to a species of Nectria and an investigation showed that in some districts from 0.5 to 2 per cent of the trees were affected, while in others as high as 40 per cent of the rubber trees were diseased. The presence of the fungus may be generally recognized by the roughened and swollen appearance of the stems and branches. If the outer bark is removed there is seen a discolored tissue which subsequently becomes brownish in color. The canker is spread by the agency of the wind, insects, such as red ants, etc.

As preventive measures the author recommends inspection and cutting out of the diseased portions and the burning of all bark and dead branches. When trees are badly affected they should be destroyed, as the presence of the fungus tends to prevent the production of latex by the trees. There is thought to be little danger of the fungus attacking nursery stock, as the smooth bark of the young trees would, in a measure, prevent the fungus gaining a lodging place.

Investigations in Helicomycelium fuliginosum, E. DUBOURG (*Mem. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 3 (1903), pp. 263–272*).—A study is given of a fungus observed in some worm-eaten railway timbers. The timbers prior to use had been treated with creosote for their preservation, but the liquid had not penetrated to their center and it was in this zone only that the fungus was found.

Some of the morphological and biological characteristics of the fungus, which was artificially grown on a number of media, are described. The fungus was found to secrete oxydase abundantly, especially in unaerated media. An attempt was made to determine the effect of various antiseptic solutions on the development of the organism. It was found to grow in solutions that are usually strongly antiseptic. Copper sulphate, bismuth subnitrate, and potassium fluorid even when used as strong as 1 part to 100 did not check growth. Corrosive sublimate, thymol, and salicylic acid 1 to 10,000 were insufficient, but when used in strengths of 1 to 5,000 checked all growth. Phenol, naphthalin, creosote, and carbolineum 1 to 2,000 destroyed the fungus, and potassium arsenite 1 to 200 had a similar effect.

To test the practical application of different treatments of wood for preservation when placed in the ground, experiments are to be conducted in which railway sleepers are to be injected with a number of fungicides and their relative efficiency noted.

Notes on recent experiences with dry rot, J. HUNTER (*Trans. and Proc. Bot. Soc. Edinburgh, 22 (1902), pt. 2, pp. 106–109*).—Notes are given on observations regarding the dry-rot fungus *Merulius lacrymans* and the effect of copper sulphate upon the mycelium of the fungus. A warning is given against the use of imperfectly seasoned timber and the inclosing of timber where good ventilation is impossible.

ENTOMOLOGY.

Proceedings of the sixteenth annual meeting of the Association of Economic Entomologists (*U. S. Dept. Agr., Division of Entomology Bul. 46, pp. 113, pls. 2, fig. 1*).—At this meeting, which was held at St. Louis, Mo., December 29–31, 1903, a number of papers were presented, the majority of which have already been noted (E. S. R., 15, pp. 545–548). The following notes refer to papers which have not been previously abstracted:

J. S. Hine presented some observations on the Tabanidæ (pp. 23–25). Different species of Tabanidæ are found to have different egg-laying habits, some of which suggest an easy means of extermination. The egg masses of *Tabanus trimaculatus* and *T. stygius* were so large and conspicuous that it was found possible to collect 60,000 eggs in one hour. This is suggested as a possible method of controlling these pests. The last named species was found to deposit its eggs almost exclusively on the leaves of sagittaria.

Ravages of grasshoppers on the ranches of Montana were discussed by R. A. Cooley (pp. 41–43). The grasshoppers did most damage along the Yellowstone River between Miles City and Big Timber. In some places the grass was so completely destroyed that ranchers were forced to sell their stock. Not a single specimen of the Rocky Mountain locust could be found. The most common species were *Aulocara elliotti*, *Melanoplus atlanis*, and *Camnula pellucida*. The use of contagious diseases in controlling grasshoppers was tried without satisfactory results.

H. Osborn strongly urged the desirability of greater stability in nomenclature (pp. 56–59). The speaker suggested the appointment of a committee to correspond with entomologists and prepare a list of preferred names for 300 of the most common species of injurious insects.

C. V. Piper gave an account of the injuries to the range from *Peranabrus scabricollis* (pp. 60, 61). This insect was stated to be injurious to range grasses and wheat in Douglas County. The pest can apparently be successfully controlled by ditching and fencing. Attempts to inoculate with the South African mucor were fruitless.

W. Newell presented notes on the insects of Georgia for 1903 (pp. 103–105). Particular mention was made of peach borer, fruit-tree bark-beetle, cotton caterpillar, chinch bug, Hessian fly, Mexican boll weevil, and *Chilocorus similis*. The last-named species was obtained from the Division of Entomology of this Department and was said to have increased rapidly.

W. C. Britton (pp. 105–107) gave economic and biological notes on green-pea louse, apple plant-louse, pear psylla, onion thrips, asparagus bettles, tent caterpillar, and European mantis.

C. M. Weed presented an account of the brown-tail moth in New Hampshire (pp. 107, 108). The region about Newburyport was said to be quite generally infested. Notes are also given on the food plants of this insect. The same author described some experiments carried out by A. F. Conradi in exterminating black flies (pp. 108, 109). It was found that the larvæ of these insects could readily be destroyed by pouring phinotas oil into the water in which they were living. This oil is heavy and comes in contact with the larvæ on the rocks. It was also found possible to brush the larvæ from the rocks by stiff brooms and catch them in fine wire screening.

Some miscellaneous results of the work of the Division of Entomology, VII (*U. S. Dept. Agr., Division of Entomology Bul. 44, pp. 99, pl. 1, figs. 19*).—Some of the aphides affecting grains and grasses of the United States are discussed by T. Pergande (pp. 5–23). The author is of the opinion that the American apple plant-louse and the grain louse are identical and that *Aphis mali* is a distinct species belonging to a different genus from the grain louse of Europe. Notes are given on the habits, food plants, and life history of this species and detailed descriptions are presented of *Macrosiphum granaria*, *M. cerealis*, and *M. trifolii*. The proper name of the European grain louse is supposed to be *Siphocoryne avenæ*.

F. H. Chittenden discusses the chestnut weevils and other nut-feeding species (pp. 24–39). The weevil injuries to chestnuts are due to the attacks of *Balaninus proboscideus* and *B. rectus*. Notes are given on the habits of these species as well as on *B. caryæ* which is injurious to hickory nuts and also on various other species of weevils. The use of arsenical or contact poisons in controlling these pests is not satisfactory. Better results are obtained from bisulphid of carbon, by heating the nuts, or by keeping them in cold storage. The same author presents an account of the cowpea-pod weevil (pp. 39–43). This species is *Chalcodermus æneus*. The best remedies in controlling it in cowpeas appear to be fumigation of the seed with bisulphid of carbon and spraying with arsenate of lead combined with Bordeaux mixture.

Additional observations on the tobacco stalk-weevil are presented by J. C. Bridwell (pp. 44–46). This insect attacks potato, tobacco, and various related wild species of plants. The weevil hibernates in the stems of tobacco or Jamestown weed. In controlling the pest, best results are obtained from burning the stalks of these plants.

F. Maskew reports results of experiments with Fuller's rose beetle in California (pp. 46–50). Where this pest attacks strawberry plants it is recommended that infested plants be pulled up and destroyed as soon as they begin to wilt. Carbon bisulphid is also recommended as well as drowning by irrigation wherever the latter method can be practiced.

C. L. Marlatt gives an account of importations of beneficial insects into California (pp. 50–56). *Scutellista cyanea* is reported as being wonderfully effective in destroying the black scale in California. The larva of this parasite feeds upon the eggs of the black scale. The parasite is easily distributed from place to place and maintains itself vigorously. It is active throughout nearly the whole year. It is said that *Rhizobius ventralis* has shown itself to be very efficient in destroying the cottony maple scale which is injurious to apples in California.

J. S. Hine presents a report on insects injurious to stock in Louisiana (pp. 57–60). During the author's study 5 species of horse flies were observed, viz, *Chrysops flavidus*, *Tabanus atratus*, *T. lineola*, *T. costalis*, and *T. quinquemaculatus*. A number of natural enemies of these pests were observed. It is suggested that large numbers of adult horse flies could be captured by the use of trap window screens.

C. L. Marlatt presents a brief account of the distillate spray in California (pp. 60, 61). It has been found that 2 per cent strength of this spray does not injure foliage but is not always completely effective.

F. V. Theobald gives an account of three British fruit pests which may be introduced on nursery stock (pp. 62–70). These pests are *Laverna atra*, *Psylla mali*, and *Eriophyes ribis*.

The cherry fruit fly is discussed by F. H. Chittenden (pp. 70–75). This pest is reported as prevalent in the District of Columbia, but as being susceptible to inclement weather. Brief notes are given on methods of controlling the pest.

Notes are also given on the natural coloration of silks of lepidoptera by G. Leverat and A. Conte (pp. 75–77).

Some preliminary notes on the clover-seed chalcis fly (*Bruchophagus funebris*) (pp. 77–80).

Salt-marsh caterpillar on cotton, by W. E. Hinds (pp. 80–84), and numerous miscellaneous topics.

Report of the government entomologist for the year 1902, C. P. Lounsbury (*Cape Good Hope Dept. Agr., Rpt. Govt. Ent. 1902, pp. 41*).—An account is given of the success which has thus far attended the introduction into Cape Colony of predaceous and parasitic insects from this and other countries for the purpose of keeping injurious insects in check.

The lime-sulphur-salt wash was found effective in controlling *Diaspis pentagona* and kerosene emulsion produced good results in combating the Bryobia mite of prune trees. Lime-salt-sulphur is more efficient, however, both as a summer and winter wash. African coast fever is believed to be carried by *Rhipicephalus decoloratus*. Several experiments were carried on for the purpose of obtaining evidence regarding the etiology and means of distribution of heartwater, malignant jaundice, and African coast fever.

Report of the government entomologist for the year 1903, C. P. Lounsbury (*Cape Good Hope Dept. Agr., Rpt. Govt. Ent. 1903, pp. 46, pls. 7*).—Brief notes are given on regulations regarding plant importations and nurseries. The desirability of an agricultural experiment station near Cape Town is urged. Experiments with ticks as related to African coast fever showed that *Rhipicephalus appendiculatus* may transmit the disease. Negative results were obtained with *R. sanguineus*.

Further investigations on heartwater indicated that sheep and cattle are subject to the disease and that it is transmitted through the agency of *Amblyomma hebræum*. Persian sheep are susceptible. The disease is not carried by the brown tick. Malignant jaundice in dogs is caused by infection with *Piroplasma canis*, which is carried by *Hæmaphysalis leachi*. Detailed notes are given on the biology of the tick and on the developmental forms of the blood parasite.

Insect record for 1902, C. M. Weed (*New Hampshire Sta. Bul. 102, pp. 70–78, figs. 4*).—Notes are given on the San José scale, brown-tail moth, gypsy moth, cankerworms, codling moth, squash bug, tent caterpillars, oyster-shell bark-louse, white fly, pear-tree psylla, tussock moth, etc. The habits and life histories of these insects are discussed and brief directions are given for combating the pests.

[Monthly bulletin of the division of zoology,] H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 2, pp. 35–64, pls. 2, figs. 6*).—Notes are given on the preparation and application of insecticides and fungicides. Lines of treatment are suggested for potato diseases. Methods of exterminating wild mustard and other weeds are described, together with notes on rose insects and remedies for plant lice and scale insects.

[Monthly bulletin of the division of zoology,] H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 3, pp. 67–96*).—Brief notes on the repression of insects and fungus diseases and also on San José scale, diseased fruit, fire blight, melon insects, mosquitoes, insects injurious to domesticated animals, etc.

Some fern and orchard pests, W. W. Froggatt (*Agr. Gaz. New South Wales, 15 (1904), No. 6, pp. 514–518, pl. 1*).—*Neosyagrius cordipennis* is described as a new genus and species of weevil injurious to maiden-hair fern. The best means of ridding ferns of these pests is to submerge the pots and plants in a tub of lukewarm water. The beetles soon come to the surface of the water and may easily be captured. Notes are also given on the habits, life history, and means of combating *Syagrius fulvitarsis*, a fern pest, and *Baris orchivora*, a weevil injurious to greenhouse orchids.

Report of nursery inspection for the State of Wisconsin, E. P. Sandsten (*Wisconsin Sta. Rpt. 1903, pp. 391, 392*).—Notes are given on the purpose of the

nursery inspection law, and also a list of nurseries which have been inspected in Wisconsin.

Catalogue of the exhibit of economic entomology at the Louisiana Purchase Exposition, St. Louis, Mo., 1904, E. S. G. Titus and F. C. Pratt (*U. S. Dept. Agr., Division of Entomology Bul. 47, pp. 155*).—In the exhibit of the Division of Entomology at the Louisiana Purchase Exposition an effort has been made to illustrate the principal injurious insects of North America in all of their stages. Particular attention has been given to the economic relations of insects and special cases have been prepared containing the models of the chief injurious insects. The bulletin contains in detail a list of all species in the exhibit.

Reading course in economic entomology, C. W. Woodworth (*California Sta. Circ. 10, pp. 18*).—On account of the number of applications for information and instruction in economic entomology, an arrangement has been made to conduct a reading or correspondence course in this subject as a part of the extension work of the California State University.

The readers who enroll for this course will be furnished with station bulletins which will serve as text-books. The work accomplished in this way will be put to the credit of the individuals who take the course and will be accepted as a part of a residence course upon subsequent matriculation at the university. Detailed directions are given on the guidance of students in the study of insects and in the use of the literature to which they are referred.

The attraction of colors and odors for insects, J. Pérez (*Mém. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 3 (1903), pp. 1–36*).—Based upon extensive experiments and observations the author has reaffirmed his opinion expressed in 1894 that insects are not attracted to flowers by their color alone.

After reviewing some recent literature regarding the attraction of insects by flowers, an account is given of observations on the attraction of various species of Bombus, Apis, Sphinx, etc., by plants growing under natural conditions, and of experiments carried on with flowers grown under conditions capable of control. As a result it is concluded that insects are guided from a distance to masses of flowers by their perfume alone. Where flowers are grown singly insects are attracted generally by color, and where the distance is small the odor also assists in attracting and directing the movements of the flying insects. In the case of apetalous flowers the perfume alone is a directive agent.

Monograph of the genus Saperda, E. P. Felt and L. H. Joutel (*New York State Mus. Bul. 74, pp. 86, pls. 14, figs. 7*).—A systematic account is presented of the genus Saperda with notes on the subgeneric grouping, bibliography, distribution, and specific relations. A list is given of the American species of the genus with a key for their identification and a detailed description of each species. The American species were compared with European and Asiatic forms. The habits, life history, natural enemies, and means of combating the more important species are discussed in detail, with references to the literature of the subject.

The Mexican cotton-boll weevil, W. D. Hunter and W. E. Hinds (*U. S. Dept. Agr., Division of Entomology Bul. 45, pp. 116, pls. 16, figs. 6*).—This bulletin contains a detailed summary of all available information regarding the habits, life history, depredations, and means of control of the cotton-boll weevil. The authors give an account of the destructiveness of the beetle and history of its introduction into Texas.

The insect is described in all of its stages and notes are given on the habits of the larva and adults upon various parts of the cotton plant. Experiments carried out for the purpose of determining whether other plants than cotton might serve as food for this insect gave negative results. In these experiments various species of Hibiscus were used as well as sunflower, bindweed, pigweed, ragweed, etc. It is con-

cluded that cotton is the only food plant of the boll weevil. Notes are given on a number of insects which have been mistaken for the boll weevil.

During the investigation of this insect it was found that cotton-seed meal could not be made to serve as food for the weevils and that it showed no power of attracting them. Negative results were also obtained in testing the value of sweets as an attraction for the weevil. A detailed account is presented of the field work of the Division of Entomology in the study of this pest and notes are given on the length of time required by the insect to pass through its various stages.

The average length of the generation of the cotton-boll weevils is believed to be about 42 days. This makes it possible for 5 generations to develop between May 1 and December 1. In one test it was found that about 16 per cent of the beetles were able to hibernate successfully. The influence of severe weather upon the weevil is not so great as was at first supposed, but is nevertheless unfavorable to the insect.

In controlling this pest, the authors believe "that the destruction of the stalks in the early fall is the most effective method known of actually reducing the numbers of the weevil." This method is, therefore, recommended as the most important one for insuring success in cotton growing for the coming year. Some difference was noted in the susceptibility of various cottons to weevil injury. The Egyptian cotton was most severely injured, followed by Sea Island, Cuban tree cotton, and Kings Improved. The relative amount of injury appears to depend somewhat upon the hairiness of the stems. The hairs on the stems hinder the movements of the beetles.

There appears to be no method of preventing the spread of the weevil to any latitude where cotton can be grown, but the insect can probably be controlled more successfully in the northern than in the southern portion of the cotton belt. Notes are given on the fungus diseases and parasitic and predatory insect enemies of the weevil. Recommendations already made by the Division of Entomology regarding the cultural means of control are repeated. Spraying is considered futile.

San José scale, E. R. Bennett (*Connecticut Storrs Sta. Bul. 30, pp. 1–16, figs. 5*).—The author made use of an opportunity to take part in the spraying of 11,000 peach and plum trees on a large fruit farm. The work was begun on March 10. The lime-sulphur-salt wash is used in the proportion of 25 lbs. lime, 20 lbs. sulphur, and 15 lbs. salt to 50 gal. water. The author believes that whatever formula is adopted the amount of lime should exceed that of sulphur.

During the season's tests it was found sufficient to boil the materials for from 30 to 45 minutes. The lime-sulphur spray did not have any injurious effect upon the skin of the workmen. A test was made of the Oregon formula, during which it appeared that the copper sulphate did not increase the effect of the solution. In order to make a thorough application of the lime-sulphur wash it is recommended that the trees be previously pruned. The wash remained on the trees in a good coating for at least 3 months.

The cost of application was about 6 cents per tree. The results were very effective in the destruction of San José scale. Leaf curl was also largely prevented.

The pernicious or San José scale insect in New Hampshire, C. M. Weed (*New Hampshire Sta. Bul. 109, pp. 73–83, figs. 3*).—Brief notes are given on the distribution of the San José scale in New Hampshire. Spraying experiments with undiluted kerosene and lime-sulphur-salt wash gave unsatisfactory results. The insect was apparently eradicated by treatment with calcothion. A copy is given of the nursery-inspection law together with brief notes on the preparation of insecticides.

Treatment of San José scale, J. H. Stewart (*West Virginia Sta. Circ. of Information 1, pp. 4*).—Brief notes on the use of mixtures and kerosene and crude oil with water and also on the application of a lime-sulphur spray in controlling the San José scale.

The codling moth, E. D. Ball (*Utah Sta. Bul. 87, pp. 104–145, pls. 7, fig. 1*).—The codling moth is considered to be the worst pest with which the fruit growers

have to contend in Utah. From 60 to 90 per cent of untreated apples are infested with this pest.

Detailed notes are given on the appearance and habits of the insect in its different stages. The first brood of moths in Utah appears shortly after the apples bloom. In warm weather the moths lay their eggs within a day or two after emerging. At Logan the eggs were laid from June 1 to 25. About 90 per cent of the eggs for the first brood were deposited upon the fruit. The moths of the second brood appear from July 20 to August 20, and the eggs of the second brood were deposited between July 22 and September 10.

Evidence is presented to show that there are 2 definite broods and no more. The codling moth attacks chiefly the apple but also infests pears and occasionally stone fruits. The damage done by the 2 broods is in proportion to their numbers, and the second brood is about 5 times as numerous as the first.

Of the many methods which have been proposed for destroying this insect only two are effective, viz, spraying and banding the trees. Notes are given on the materials and apparatus suitable for spraying. The first application should be made from above downward so as to fill the calyx cups. This application should be made as soon as possible after the blossoms fall. A second spraying should be applied within from 10 days to 2 weeks.

The author believes that if the first two applications are thoroughly and carefully made later sprayings will be unnecessary. Paris green was used for this purpose at the rate of 1 lb. to 50 gal. of water. An examination of Paris green as observed in Utah indicated that this product is rarely adulterated. It is believed not to be necessary to add lime to Paris green to prevent its burning the foliage.

Bands should be placed on the trees a few days before the first worms crawl out and should be kept on until fall. The bands should be examined every 9 days during the existence of the first brood and once at the end of the season. The total cost of spraying was found to be about 1 per cent of the value of the crop. It was found possible to harvest from 90 to 95 per cent of sound apples by proper spraying and banding. Among remedies of little or no value mention is made of trap lanterns, winter spraying, hogs in orchards, picking up windfalls, and air-pressure sprays.

The brown-tail moth in New Hampshire, C. M. Weed (*New Hampshire Sta. Bul. 107, pp. 47–60, figs. 10*).—The brown-tail moth was first noticed in New Hampshire in 1899 and has since been introduced in several towns, so that the southeastern portion of the State is quite badly infested. Notes are given on the habits and life history of this insect.

A brief account is given of the damage to trees from the depredations of the brown-tail moth, and also of a skin disease in man caused by the nettling hairs of the caterpillars. A list is given of the towns infested by the pest. As treatment for this insect the following remedies are suggested: Cutting off and burning the winter nests, and spraying with arsenate of lead in the spring after the leaves have developed.

Some recent investigations on the black-currant gall mite, W. E. Collinge (*Birmingham, England: J. G. Hammond & Co., Ltd., 1904, pp. 12, pl. 1, fig. 1*).—An elaborate account is presented of the habits and life history of *Eriophyes ribis*, together with notes on related species. Methods of distribution, food plants, and remedial measures are discussed. Neither fumigation nor the use of spraying fluids has been attended with satisfactory results. Cutting and burning infested bushes will help in exterminating the pest in any given locality.

Black-currant mite (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, p. 702, pl. 1*).—The only way of eradicating this pest is to dig up and burn all infested bushes.

The striped cucumber beetle, W. M. Morgan (*West Virginia Sta. Circ. of Information 3, pp. 4*).—In combating this pest the author recommends the destruction of

all rubbish, planting squashes as trap crops, and spraying melon seedlings with Bordeaux mixture.

Leather-jacket grubs (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, pp. 719–721, figs. 2*).—The larvæ of crane flies are said to be serious pests in grain fields and meadows in Ireland. Careful plowing and the use of fertilizers are recommended in controlling these pests.

Grasshopper and cricket outbreaks, J. M. Aldrich (*Idaho Sta. Bul. 41, pp. 289–304, pl. 1, figs. 3*).—The Rocky Mountain locust was not concerned in any of the recent outbreaks in Idaho. The most important species was *Camnula pellucida*. The most serious outbreaks occurred on Big Camas prairie and near Market Lake. The duration of a locust plague appears to be about 5 years, and is apparently brought to an end by the combined action of the natural enemies of the locust.

Experiments with the South African grasshopper fungus were quite unsatisfactory. An experiment with crude petroleum showed that the locusts could be destroyed by the use of this remedy but that the method was too expensive. Burning under straw was recommended and also the use of hopperdozers. The author also mentions such remedies as plowing under the eggs, the use of irrigation ditches, and poisoning with the Criddle mixture.

An account is presented of the depredations of *Anabrus simplex*. This cricket hatches most extensively in arid foothills and feeds on sagebrush. The pest has been kept off from cultivated fields by the use of irrigation ditches and by driving in swarms.

Control of the brown ant (Solenopsis geminata) in orange orchards, O. W. Barrett (*Porto Rico Sta. Circ. 4, pp. 3*).—This ant normally feeds on the honey wax secreted by scale insects. Under certain conditions, however, it attacks citrus trees, causing an excretion of gum upon which it feeds. The ants also attack the flowers, young fruit, terminal buds, and small twigs. In order to prevent the ants from ascending the trees it is recommended that the trunks of trees be painted with a mixture containing a yellow resin, linseed oil, and tobacco decoction. For destroying the ants in their nests the use of a mixture of resin 2 parts, sal soda 1 part, and tobacco decoction 1 part is recommended. This mixture may be applied directly in the galleries of the nests. This circular is issued in both English and Spanish editions.

The chemical composition of some insecticides for the potato beetle, R. Harcourt (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 59–62*).—An account is given of the proper composition of Paris green with notes on its use as an insecticide, especially in the control of potato beetles. The author discusses the use of London purple, lead arsenate, slug shot, Bug Death, and certain other proprietary insecticides.

Paris green spraying experiments, J. K. Haywood (*U. S. Dept. Agr., Bureau of Chemistry Bul. 82, pp. 32, pls. 2*).—The experiments reported in this bulletin were undertaken for the purpose of determining how much soluble arsenious oxid may be present in Paris green without injuring the foliage. It was found that the soluble arsenious oxid in a sample of Paris green may be of two kinds, viz, that which is readily soluble in water and that which becomes soluble by decomposition of poorly made Paris green.

Samples of Paris green were obtained and the amount of soluble arsenious oxid carefully determined. The amounts of soluble arsenic were then artificially increased if necessary so that samples were obtained which contained amounts varying from 2.24 to 8 per cent. As a result of numerous spraying experiments it is concluded that the following amounts of soluble arsenious oxid are safe when sprayed without the use of lime, viz, for apple trees, 6 per cent; for pear trees, 6 per cent; for plum trees, 4 per cent, while with the use of lime the following amounts are regarded as safe, viz, for apple trees, 7 per cent; for pear trees, 7 per cent; for plum trees, 5 to 6 per cent; and for peach trees, 4 to 5 per cent.

It is not considered safe to use any Paris green on the peach trees without the addition of lime. The difference in the effect produced by Paris green when sprayed with and without the addition of lime is so great that the use of lime is recommended in all cases.

Tobacco extract and its application in combating injurious insects, A. SMIRNOFF (*Svenska Trädgårdsför. Tidskr., 1903, No. 4, pp. 60–62*).

Fumigation practice, C. W. WOODWORTH (*California Sta. Circ. 11, pp. 27, figs. 24*).—This circular contains in a slightly revised and condensed form the material presented in Bulletin 122 of the California Station (E. S. R., 11, pp. 64, 65).

Gasolene as a remedy against enemies of the squash, cucumber, and pumpkin, F. W. CARD and A. E. STENE (*Rhode Island Sta. Rpt. 1903, p. 216*).—Gasolene was tested as a remedy for the squash borer and the larvæ of the striped beetle. Holes were made in the ground about 7 in. deep, and from 2 to 4 teaspoonfuls of gasolene were poured in each hole. The method proved wholly ineffective against these insects.

Seed and soil treatment and spray calendar, W. J. GREEN and A. D. SELBY (*Ohio Sta. Bul. 147, pp. 41–53*).—This is a revised edition of Bulletin No. 102 of the same station (E. S. R., 11, p. 274). The information contained in the bulletin is also published in a folio form.

Foul brood (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, pp. 723–729, pls. 3*).—The sources of infection, symptoms, and treatment of this disease are described in detail. In preventing foul brood it is recommended that hives be placed on dry stands, that the hives be kept clean and tight, that old combs be rejected and old colonies strengthened by combination, and that pieces of naphthalin be kept in each hive.

FOODS—NUTRITION.

Breakfast foods, F. W. ROBISON (*Michigan Sta. Bul. 211, pp. 25, charts 2*).—The principles of nutrition are discussed and the results of analyses of 48 samples of breakfast foods and similar goods are reported. In addition to the usual constituents the insoluble starch and the materials soluble in water (ash, protein, sucrose, dextrin, and soluble starch) were determined. The insoluble starch varied from 17.59 to 77.13 per cent, being over 40 per cent in all but 8 cases. The total soluble material ranged from 2.75 to 55.15 per cent, and the dextrin from 1.02 to 25.50 per cent. The author's conclusions follow:

"The breakfast foods are legitimate and valuable foods.

"Predigestion [i. e., rendering insoluble material soluble by malting or other treatment] has been carried on in the majority of them to a limited degree only. The price for which they are sold is as a rule excessive and not in keeping with their nutritive values.

"They contain as a rule considerable fiber, which while probably rendering them less digestible at the same time may render them more wholesome to the average person.

"The claims made for many of them are not warranted by the facts. The claim that they are far more nutritious than the wheat and grains from which they are made is not substantiated. They are palatable as a rule and pleasing to the eye.

"The digestibility of these products as compared with highly milled foods, while probably favorable to the latter, does not give due credit to the former, because of the healthful influence of the fiber and mineral matter in the breakfast foods.

"Rolled oats or oatmeal as a source of protein and of fuel is ahead of the wheat preparations, excepting of course the special gluten foods, which are manifestly in a different class."

West Indian starches, W. R. BUTTENSHAW (*West Indian Bul., 5 (1904), No. 1, pp. 1–40, figs. 15*).—West Indian starch-bearing plants and the methods followed by

the author in separating starches are described, and the results of investigations of the microscopical character of the starch grains of a large number of plants are reported, including the following: Sour sop, green mango, mango kernel, crab's eye (*Abrus precatorius*), pigeon pea (*Cajanus indicus*), red pea, yam bean, cho-cho (*Sechium edule*) nightshade, 3 varieties of Ipomœa, four o'clock, pink coralita (*Antigonon insigne*), cassava, breadfruit, 2 varieties of canna, arrowroot, ginger, banana, plantain, yampie (*Dioscorea trifida*), 5 varieties of yam, tannia (*Colocasia esculenta*) wild and cultivated, maize, and guinea corn.

The large number of starches studied emphasizes the fact that the principal sources of starch in the West Indies are the roots of the plants rather than in the seeds. All the starches obtained from roots and tubers, the author states, showed a play of colors with polarized light and may be readily grouped in 2 divisions. "In the first are those bounded by rounded surfaces (i. e., either oval or ovate); hilum and concentric rings clearly visible. The examples are the yams, the cannas, arrowroot, and ginger. It will at once be noticed that these plants belong to natural orders which are not far removed from one another, and emphasis is added to this when it is observed that among the remaining starches in this group are to be found those of the tribe Museæ (banana and plantain).

"With regard to the remaining 'root' starches, they all agree in several characters. They all show some coloration with polarized light, and among the many-angled there are some rounded forms, sugar-loaf forms being often present. There is so much similarity among these starches that it will not be found an easy matter to distinguish them until details as to appearance of hilum, measurements, etc., are taken into account. The only starch in this group that is not a 'root' starch is that obtained from the green mango, just as the only 'seed' starch in Class I was mango starch. . . . The further study of fruit starches would, perhaps, be a profitable one. So far as can be seen at present there is very little uniformity. . . . As a general rule it is stated that seed starches (at any rate, those of the cereals) show no iridescence with polarized light; mango-seed starch, however, gives quite a brilliant play of colors."

In general the leguminous starches showed little or no iridescence when examined with polarized light and considerable uniformity was observed. "An exception has, however, to be noted in the case of groundnut starch (*Arachis hypogæa*), as also in the case of the starch from the root of the yam bean (*Pachyrhizus tuberosus*). In the case of the latter we have what may be called the usual dicotyledonous 'root' form of starch instead of the typical leguminous seed form. Evidently the striking uniformity in the case of leguminous starches is confined to the seeds. The only cereal starches on this list will be found classed with the leguminous starches; the only points of resemblance, however, are the invisibility of concentric rings, the absence of iridescence with polarized light, and the presence of a more or less stellate hilum. The starches of breadfruit and jack fruit are placed by themselves in the class which contains wheat, barley, rye, etc."

In his investigations the author has followed the classification of starches suggested by Blyth, but believes that the systems for the classification of starches now in use are unsatisfactory and should be revised.

"Another interesting point is brought out by this investigation, which appears to be worthy of mention here. While in most cases there is a more or less distinct resemblance between the starch grains of plants in any particular family, several instances have been recorded where there is a decided variation. . . . [Among the starches examined] there are some that might be utilized as producers of starch for laundry purposes, while in other cases easily digested food, suitable for infants and invalids, might be obtained, as for example, from the cho-cho root and the yam bean."

Roots and tubers as food (*Iowa Agr., 4 (1904), No. 6, pp. 242–244*).—The composition and food value of a number of sorts of roots and tubers are briefly discussed.

The composition of different sorts of artichoke tubers harvested in spring and fall, P. Behrend (*Jour. Landw., 52 (1904), No. 1–2, pp. 127–143*).—Analyses by H. Wolfs and H. Grotowsky are reported and discussed. In addition to the usual constituents, pentosans and other members of the carbohydrate group were determined. On an average there was little difference between the dry-matter content of the artichokes harvested in the spring and fall.

The artichokes kept well and did not change much when stored for 3 or 4 months in a cellar though, generally speaking, there was a loss of water and a corresponding gain of dry material. The value of artichokes for the production of alcohol and this phase of the subject of artichoke raising are spoken of.

Consumption of fat in the Tropics, O. Effertz (*Wiener Klin. Wchnschr., 17 (1904), No. 2, p. 37; abs. in Zentbl. Physiol., 18 (1904), No. 3, p. 84*).—The author noted that large amounts of fat were eaten in tropical Central America and suggests reasons for this.

The natural oil foods, A. S. Atkinson (*What-to-Eat, 16 (1904), No. 6, p. 185*).—The author believes that vegetable oils are worthy of an important place in the diet.

The calcium and iron content of foods, G. von Bunge (*Ztschr. Biol., 45 (1904), No. 4, pp. 532–539*).—According to the author the only mineral constituents which might be deficient in the diet are calcium and iron. Ash analyses of foods are reported and others quoted for purposes of comparison, and the principal foods arranged according to their ash and calcium content, the largest amount of calcium oxid, 1,510 mg. per 100 gm. dry matter, being found in cow's milk, and the largest amount of iron, 340 mg. per 100 gm. dry matter, in hemoglobin.

The form in which mineral constituents, especially calcium, are assimilated is discussed. In the author's opinion it is doubtful if inorganic calcium salts as they occur in potable waters are absorbed and assimilated under all conditions.

The chemical composition of the inner part of the shell of the coffee bean, B. von Bittó (*Jour. Landw., 52 (1904), No. 1–2, pp. 93–95*).—Proximate and ash analyses are reported.

The work of the Elberfeld analytical laboratory for 1903, J. Heckmann and A. Lauffs (*Ber. Tät. Chem. Untersuchungs. Elberfeld, 1903; abs. in Hyg. Rundschau, 14 (1904), No. 10, pp. 475, 476*).—Among the data reported are analyses of a large number of samples of meat, butter, and other food products.

A swelling of canned peas accompanied by a malodorous decomposition, H. A. Harding and J. F. Nicholson (*New York State Sta. Bul. 249, pp. 153–168*).—Studies were undertaken of bacteria causing serious losses of canned peas at a cannery. In general the spoiled cans presented a bulged appearance, and in some cases they were blown open. The peas had a disagreeable odor suggesting hydrogen sulphid. They were mushy, the skins were inflated, and the liquor was darkened and of a greenish tinge, due to particles of the ruptured peas. A few of the spoiled cans (about 1 per cent) were but slightly swelled. In these the contents had an acid but not especially disagreeable odor and the appearance of the peas was normal, though the liquor was distinctly milky and possessed a sharp acid taste.

A microscopical examination of the juice showed that the cans in which the disagreeable odor was noticed all contained a rod form of bacteria, the spores of which survived the heat employed in processing the cans. This bacterium, which was studied in pure culture and described, was found to be the cause of the fermentation. Experiments show that the spores were destroyed on heating 2-lb. cans of peas at 240° F. (115 5/9° C.) for 30 minutes. When this method of processing was tested on a large scale at a factory the micro-organisms were destroyed without injuring the commercial quality of the goods.

A coccus form of bacteria was separated from the sour cans not characterized by a disagreeable odor and this was studied "sufficiently to show that it would not only sour cans of peas when artificially introduced but that when kept at blood heat these cans would commonly bulge."

A pea canners' problem solved, F. H. Hall, H. A. Harding, and J. F. Nicholson (*New York State Sta. Bul. 249, popular ed., pp. 7, fig. 1*).—A popular summary of the above bulletin.

Miscellaneous bacteriological investigations (*Wisconsin Sta. Rpt. 1903, pp. 241, 242*).—Two investigations which have been carried on at the station are summarized, namely, Gaseous Fermentations in the Canning Industry, by H. L. Russell (E. S. R., 8, p. 699) and "Sticky" or "Slimy" Bread and Its Causes, by H. L. Russell (E. S. R., 11, p. 565).

Food requirements and hunger, Meisl (*Klin. Ther. Wchnschr., 1903, No. 1–2; abs. in Ztschr. Diätet. u. Phys. Ther., 8 (1904), No. 2, p. 117*).—The reasons for the sensation of hunger and related topics are discussed.

Concerning diet in hot seasons and warm climates, Hirschfeld (*Deut. Med. Wchnschr., 1902, No. 38; abs. in Ztschr. Diätet. u. Phys. Ther., 7 (1904), No. 12, p. 694*).—According to the author meat is desired in smaller amounts than usual, and the diet should contain foods furnishing an abundance of fat and carbohydrates. In addition to vegetables, milk (especially canned cream) is recommended.

Experiments on the food of man, L. Grandeau (*Jour. Agr. Prat., n. ser., 7 (1904), No. 20, pp. 641, 642*).—Experiments with the respiration apparatus are discussed, particularly the classic experiments by J. Ranke.

Dietary studies in the James Millikin University, 1904 (*Decatur, Ill., 1904, pp. 36*).—In connection with class work in domestic science dietaries covering a period of one week were planned, the object being to supply a minimum of 4 oz. of protein and 3,000 calories of energy per man per day, the cost of the raw food not to exceed 25 cts. Of the 11 studies planned 10 were tested with families of professors, groups of students, or other persons doing light or moderate muscular work.

"While there was scrupulous care in the week's test to avoid waste, and 'left-overs' usually appeared again in some appetizing form or were used in the soup pot, no account was taken of the ordinary waste of a thrifty family—through desire to make as little trouble for the housekeeper as possible, and as little divergence from the ordinary routine, in the hope that a dietary study may be regarded as a simple affair, and one to be easily undertaken . . . The meals were enjoyed, and surprise was expressed that such acceptable food could be furnished for the money. In one case the family experimented on was unaware of the fact, and in every instance much less money was expended than usual."

The food question in health and in disease (*British Med. Jour., 1904, No. 2264, p. 1208*).—The importance of a knowledge of food requirements is briefly discussed and the need of a thorough knowledge of dietetics by medical practitioners is pointed out.

Concerning the red and white meat in the diet of patients with acute nephritis, A. Kuschnir (*Prakt. Wratsch., 1902, Nos. 44, 45, 47, 48, and 49; abs. in Ztschr. Diätet. u. Phys. Ther., 8 (1904), No. 1, p. 57*).—When red and white meat were compared no differences were observed in the quantity of urine excreted per day, or in the renal excretion of nitrogen, urea, uric acid and extractives.

Concerning the use of artificial meat extract as a food and condiment, A. Castiglioni, Jr. (*Wien. Med. Presse, 1903, Nos. 45, 46; abs. in Ztschr. Diätet. u. Phys. Ther., 8 (1904), No. 1, p. 54*).—The value of a commercial meat extract is discussed.

Practical cookbook, Henriette Davidis (*Milwaukee: C. N. Caspar Co. [1904], 2. ed.; rev. in Boston Cooking-School Mag., 9 (1904), No. 1, p. XIV*).—This volume is published with German and English text and is the second American edition.

The cookery of corn, Virgilia Purmort (*Iowa Agr., 4 (1904), No. 6, pp. 223–225*).—The food value of corn is discussed and the importance of soaking corn meal before it is used for bread making, etc., is spoken of.

Institution recipes, Emma Smedley (*Philadelphia: William F. Fell Co. [1904], pp. 124; rev. in Boston Cooking-School Mag., 9 (1904), No. 1, p. XIV*).—On the basis of laboratory experiments and practical experience the author has prepared a collection of recipes for use in schools, hospitals, and other institutions. The quantities given in the recipes will serve, with a few exceptions, 150 persons.

When is a banana ripe? (*British Med. Jour., 1904, No. 2265, pp. 1271, 1272*).—It is said that bananas are in the best condition for eating when they are so ripe that the skins show dark spots.

Boric acid in foods, J. Prescher (*Arch. Pharm., 242 (1904), No. 3, pp. 194–210*).—Different methods of estimating boric acid are compared and a method proposed in which it is determined as bor-phosphate, which is regarded as too complicated for the convenient use of food chemists, though it gives very accurate results. Joergensen's method is regarded as the most practicable.

Fish preserved with the natural taste retained, M. Henseval (*Trav. Sta. Recherches Pêche Maritime Ostende, 1903, pp. 33–37; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 555*).—According to the author, fish pickled for a short time and then processed in tins for one-half hour at one-half the usual atmospheric pressure retain their normal taste and aroma.

Foreign import tariffs on meat and meat products, 1903, F. H. Hitchcock (*U. S. Dept. Agr., Division of Foreign Markets Bul. 35, pp. 64*).—Data are presented in tabular form which show the tariff rates and regulations enforced by various foreign countries with respect to the importation of meat and meat products.

Concerning the calculation of the heat of combustion of nitrogenous organic compounds, P. Lemoult (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 15, pp. 900–902*).—Formulas for use in calculating heat of combustion of nitrogenous materials are proposed and discussed.

New experiments on the physiological action of the proteoses, F. P. Underhill (*Amer. Jour. Physiol., 9 (1903), No. 6, pp. 345–373, dgms. 2; reprinted in Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 24*).—Previously noted (E. S. R., 15, p. 704).

Urea and urein, W. O. Moor (*Ztschr. Biol., 45 (1904), No. 4, pp. 420–463, 540, 541*).—The investigations, which are reported and discussed at length, led the author to conclude that the principal nitrogenous body in human urine is not urea but a compound which closely resembles it in its behavior toward reagents, for which he proposes the name urein. Like urea it forms compounds with oxalic acid, mercuric nitrate, and mercuric chlorid; is soluble in water, absolute alcohol, alcohol and ether, and glycerin. It differs, however, from urea in that it reduces permanganate of potash; is oily in form, yellow in color; has a marked odor; and is only slightly soluble in amyl alcohol.

ANIMAL PRODUCTION.

Feeding stuffs (*Wisconsin Sta. Rpt. 1903, pp. 302–306*).—The work of the station regarding the composition and inspection of feeding stuffs is summarized. The articles included are as follows: Examination of Oil Meals, by F. W. Woll (E. S. R., 8, p. 712); Examination of Miscellaneous Fodders, by F. W. Woll (E. S. R., 8, p. 719); Analyses of Wild Prairie Hay, by F. W. Woll (E. S. R., 9, p. 577); Composition of Feeding Stuffs, by F. W. Woll (E. S. R., 9, p. 581); Analyses of Feeding Stuffs, by F. W. Woll (E. S. R., 12, p. 71); The Law Regulating the Sale and Analysis of Concentrated Feeding Stuffs in Wisconsin, by W. A. Henry (E. S. R., 13, p. 676); Concentrated Feeding Stuffs Licensed for Sale in Wisconsin, 1902, by F. W. Woll

(E. S. R., 13, p. 977); Licensed Commercial Fertilizers and Concentrated Feeding Stuffs, 1902, by F. W. Woll and A. Vivian (E. S. R., 14, pp. 235, 279); Licensed Commercial Feeding Stuffs, 1902, by F. W. Woll and G. A. Olson (E. S. R., 14, p. 790); Analyses of Licensed Commercial Feeding Stuffs, 1902, by F. W. Woll and G. A. Olson (E. S. R., 14, p. 1001); Concentrated Feeding Stuffs and Fertilizers Licensed for Sale in Wisconsin, 1903, by F. W. Woll (E. S. R., 10, pp. 954, 1002); Licensed Commercial Fertilizers and Feeding Stuffs, by F. W. Woll and G. A. Olson (E. S. R., 15, pp. 463, 498); Licensed Commercial Feeding Stuffs, 1903, by F. W. Woll and G. A. Olson (E. S. R., 15, p. 801); and Concentrated Feeding Stuffs and Fertilizers Licensed for Sale in Wisconsin, 1904, by F. W. Woll (E. S. R., 15, p. 993).

The fact is noted that in addition to the above a number of the station reports have contained miscellaneous analyses of feeding stuffs, and that a general discussion of the subject has also been published (E. S. R., 9, p. 581).

Licensed concentrated feeding stuffs, F. W. Woll and G. A. Olson (*Wisconsin Sta. Bul. 113, pp 13–17, 20–22*).—A list is given of the feeding stuffs licensed for sale in 1904 together with their guaranteed protein and fat content. The State feeding-stuff law is quoted and suggestions are made regarding the purchase of concentrated feeds.

Commercial feeding stuffs (*Connecticut State Sta. Rpt. 1903, pt. 5, pp. 371–427*).—The data reported have been noted from another publication (E. S. R., 15, p. 889).

The feeding value of rape and other succulent foods (*Wisconsin Sta. Rpt. 1903, pp. 46–55*).—The growth and uses of the rape crop are discussed and the station investigations which have to do with its feeding value are summarized and discussed, the articles included being Growth and Uses of the Rape Crop, by J. A. Craig (E. S. R., 10, pp. 741, 773, 781); Rape for Feeding Sheep, by J. A. Craig (E. S. R., 8, p. 327); Succulent and Dry Rations for Fattening Lambs, by J. A. Craig (E. S. R., 8, p. 715); Rape Versus Clover for Growing Pigs, by W. L. Carlyle (E. S. R., 11, p. 570; Rape Versus Clover for Pigs, by W. L. Carlyle (E. S. R., 12, p. 76); Feeding Value of Rape for Growing Pigs, by W. L. Carlyle (E. S. R., 13, p. 80); and The Feeding Value of Rape for Swine, by W. L. Carlyle (E. S. R., 13, p. 981).

Report on the relative effects of superphosphate and basic slag upon the feeding quality of swedes, J. W. Paterson (*West of Scotland Agr. Col. Rpt. 1901, pp. 45–51*).—It was found that 40 sheep fed Swedish turnips manured with basic slag gained 15 per cent more than an equal number similarly treated in every way except that they were fed Swedish turnips manured with superphosphates. The turnips were analyzed and "taking weight of dry turnip matter into consideration, the respective positions per acre were as 97 to 100." Considering both yield and feeding value, basic slag "produced the smaller but the more valuable crop."

The principal feeds and fodders available to Ontario farmers, G. E. Day (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 42–50, dgm. 1*).—A paper with discussion dealing with the composition and feeding value of concentrated and coarse feeding stuffs.

Indian food grains and fodders; their chemical composition, II, J. W. Leather (*Agr. Ledger, 1903, No. 7 (Med. and Chem. Ser., No. 16), pp. 147–192 + III*).—Analyses are reported of a large number of samples of rice and other cereal grains, leguminous seeds, oil-bearing seeds, oil cakes, milling products, chaff, straw, and cereal and leguminous forage crops, fresh and cured.

Sarco-phosphoric acid as a constituent of the central nervous system, A. Panella (*Gior. R. Accad. Med. Torino, 1903; abs. in Zentbl. Physiol., 18 (1904), No. 4, p. 114*).—As shown by quantitative determinations, sarco-phosphoric acid is a constant constituent of the large and small brain of lambs, pigs, calves, rabbits, guinea pigs, chickens, cats, and dogs.

Some of the effects of excessive nutrition, J. H. Shepperd (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 98–101*).—A consideration of data which is briefly summarized,

in the author's opinion, warrants the conclusion that "overnutrition stimulates development, induces a shorter growth period, reduces the degree of prolificacy, causes a finishing of the flesh in live stock, brings about earlier changes in the dentition of stock, and causes a delicacy of constitution and premature decay."

The effect of condiments upon digestibility, G. FINGERLING (*Jour. Landw., 52 (1904), No. 1–2, pp. 145, 146*).—Continuing earlier work (E. S. R., 15, p. 605), the author studied with sheep the effect of aromatic substances or condiments upon the digestibility of a basal ration. It is stated that the test covered 8 or 10 days, but experimental data are not reported. It appeared that fennel, fenugreek, and anise had no effect upon the digestibility of the basal ration, and from the work as a whole the general conclusion was drawn that condimental feeds do not induce rapid fattening of animals.

Report on experiments on the winter fattening of cattle, 1899–1900, J. W. PATERSON (*West of Scotland Agr. Col. Rpt. 1900, pp. 1–22*).—In this article, which was previously published as Bulletin No. 6 of the college, a full report is given of experiments noted from another publication (E. S. R., 12, p. 478).

Experiments on the fattening of cattle on pasture, 1901, J. W. PATERSON (*West of Scotland Agr. Col. Rpt. 1901, pp. 9–12*).—The relative feeding value of decorticated cotton-seed cake, alone and mixed with an equal quantity of corn meal, was studied with steers fattened on pasture. The greatest gains and the most profit were noted with the lots receiving the mixed-grain ration.

Report on experiments on the winter fattening of sheep, 1899–1900, J. W. PATERSON (*West of Scotland Agr. Col. Rpt. 1900, pp. 23–44*).—In a test of different concentrated feeds for sheep decorticated cotton-seed cake and maize 1:1 gave better results than linseed cake alone, or with oats or a mixture of linseed cake, oats, decorticated cotton-seed cake, and maize.

In the author's opinion the maize could be exchanged for oats in many cases with advantage. "Linseed cake alone, to supply concentrated food, is too laxative to succeed in a root diet. . . . Linseed cake is specially unsuited for animals requiring short keep. . . . A limited quantity of roots has a high value in sheep feeding. Hay or other fibrous food must be given along with them to regulate digestion."

In this test the comparative advantages of feeding under cover or out of doors were taken into account. According to the author, "house feeding is not to be recommended for periods less than 6 weeks. In longer periods the advantages depend upon the state of the weather and the kinds of food used. With a serious fall of temperature, or with excessive rainfall in the later periods, housing is an advantage with every food. It is of the greatest advantage with those foods which are of the most laxative character."

This article was previously published as Bulletin No. 7 of the college.

Experiments in lamb feeding (*Wisconsin Sta. Rpt. 1903, pp. 56–68*).—The station experiments on lamb feeding are summarized, the articles included being as follows: Grain Feeding Lambs for Market, by J. A. Craig (E. S. R., 8, pp. 332, 720); Farm Grains for Fattening Lambs, by J. A. Craig (E. S. R., 8, p. 714; 9, p. 578); Fall-Shearing Lambs Before Fattening, by J. A. Craig (E. S. R., 8, p. 329); Corn Meal, Bran and Oats for Lambs Before and After Weaning, by J. A. Craig (E. S. R., 8, p. 714); Grain for Lambs Before Weaning, by J. A. Craig (E. S. R., 10, p. 774); Farm Grains for Lambs Before and After Weaning, by W. L. Carlyle (E. S. R., 11, p. 567); Grain Mixture for Lambs Before and After Weaning, by J. A. Craig (E. S. R., 10, p. 775); and Feeding Ground Corn Versus Ground Peas to Lambs Before and After Weaning, by W. L. Carlyle (E. S. R., 12, p. 74).

Breeding lambs for market (*Wisconsin Sta. Rpt. 1903, pp. 69–73*).—The following investigations are summarized: Breeding Early Lambs, by J. A. Craig (E. S. R., 9, p. 328); Lambs for Early Spring Market, by J. A. Craig (E. S. R., 10, p. 775); and Influence of Breeding on the Feeding Qualities of Lambs, by J. A. Craig (E. S. R., 9, p. 577).

The flock and its management (*Wisconsin Sta. Rpt. 1903, pp. 74–81*).—The station experiments in sheep feeding, management, and related topics are summarized, the following articles being included: Establishing a Flock of Mutton Sheep, by J. A. Craig (E. S. R., 10, p. 776); Three Types of Market Sheep, by W. L. Carlyle (E. S. R., 14, p. 996); The Comparative Feeding Value of Corn Fodder, Corn Silage, Roots and Hay for Feeding Breeding Ewes in Winter, by W. L. Carlyle (E. S. R., 13, p. 77); The Comparative Value and the Effect Upon the Lamb Crop of Feeding Various Rations to Ewes in Winter, by W. L. Carlyle (E. S. R., 13, p. 978); The Comparative Value and Effect Upon the Lambs of Feeding Various Grain Rations to Pregnant Ewes, by W. L. Carlyle (E. S. R., 14, p. 996); Some Observations on Sheep Breeding from the Experiment Station Flock Records, by W. L. Carlyle and T. F. McConnell (E. S. R., 14, p. 996); and A Dipping Vat for Sheep, by J. A. Craig (E. S. R., 8, p. 720).

Fertility in sheep, F. H. A. MARSHALL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 34–43*).—From a consideration of the data regarding the fertility of ewes, the author believes that "the question of flushing and, what is closely related to it, the question of the causes producing follicular degeneration, require further investigation, must be generally admitted, and should, in fact, be emphasized. In the meantime, perhaps, the general practical conclusion to be drawn . . . is that it is better to keep breeding ewes in good thriving condition as continuously as possible than to submit them to a forced and rapid process of artificial stimulation at the tupping period, while maintaining them at other times of the year on mere sustenance diet. The consideration of the age of the ewe, as an important factor in determining the effects of flushing, should also not be neglected." Other topics relating to fertility are discussed.

Angora goats on an Iowa farm, B. W. CROSSLEY (*Iowa Agr., 4 (1904), No. 6, pp. 227–229*).—A brief account of experience with a flock of grade Angora goats, which the author considers successful. The goats were allowed the run of an open shed and were fed some corn in addition to the feed which they gathered.

The 100 does in the flock dropped 93 kids during April. In October the kids were weaned; the young does, 52 in number, were turned back with the flock, and the wethers were fattened, being given alfalfa hay with 1.5 bu. of corn for 84 days. They weighed 80 lbs. per head on an average and were sold for $4.85 per 100 lbs. At the end of 2 years the flock was sold and, according to the author, returned a satisfactory profit in addition to clearing up a considerable tract of land.

Some results in swine feeding, J. WITHYCOMBE (*Oregon Sta. Bul. 80, pp. 19, figs. 4*).—A number of experiments in which various feeding stuffs are compared are reported and discussed with special reference to the local pig-feeding industry.

In a study of the value of apples, 3 pigs about 8 months old were fed all the apples they would consume for 29 days. The total gain made was 41.5 lbs., 38.5 lbs. of which was made during the first 14 days of the test, and is attributed by the author to the filling up of the intestinal tract with succulent food or to the influence of previous feed. During this time the total amount of apples consumed was 2,016 lbs. The pigs remained in good health, "although during the last week they began to manifest symptoms of restlessness which were evidently expressions of hunger for a more nitrogenous diet.

"Hogs can not be expected to make a satisfactory growth upon apples alone, as they contain but a small percentage of muscle-forming material. However, if some nitrogenous supplementary feed were fed, doubtless the apples would have given better results."

Apples, whole and cut clover silage, and pea silage were compared as a maintenance ration with brood sows, the clover silage being supplemented during one period by wheat chop and skim-milk. According to the author the test showed that the clover silage for mature hogs is slightly better than a maintenance ration and that

"64.3 lbs. of apples will not only maintain a matured hog in good condition, but enable it to add 1 lb. to its live weight. The experiment also indicates that a ration of 1 lb. of crushed wheat, 2 lbs. of skim milk, and 6.66 lbs. of clover silage fed to a brood sow weighing 300 lbs. or over will keep her in good condition when not suckling pigs."

The value of clover pasture for growing pigs was tested with 12 animals about 3 months old, hurdled on 26 sq. rods of good clover pasturage. In 3 months there was a total gain of 253 lbs. According to the author, "one acre of good clover for growing hogs represents a value of $44.36."

As regards the value of rape, 10 young pigs gained 154 lbs. when turned on an acre of June sown rape for 42 days and kept in a thriving healthy condition, although they received no other feed.

A thrifty barrow fed, in a pen, rape, vetch, skim milk, and a little grain gained 184 lbs. in 70 days, requiring 3.19 lbs. of crushed wheat and 1.52 lbs. of skim milk in addition to the green feed for a pound of gain.

The value of soiling matured pigs was studied with a lot of 4. In 1 month they made a total gain of 25 lbs., requiring 85.48 lbs. of green feed and 1.36 lbs. of mixed grain per pound of gain. The soiling crops fed were rape, crimson clover, and alfalfa. During the next month they were fed green alfalfa only and made a total gain of 5 lbs., requiring 328.4 lbs. of the green feed to produce a pound of gain. In the author's opinion better results would have been obtained had the pigs been pastured on alfalfa.

In a second test 16 young pigs were fed from May 1 to June 2 crimson clover and alfalfa, with skim milk and crushed wheat. The total gain made was 221 lbs. and the feed required per pound of gain 15.85 lbs. skim milk, 7.66 lbs. of the soiling crop, and 0.34 lb. grain.

Supplementing a ration of green feed and skim milk with grain was studied with 2 lots of 8 pigs each. On alfalfa and skim milk the total gain made in 30 days was 130 lbs. On skim milk and alfalfa supplemented by crushed wheat the total gain was 125 lbs. The lot fed the grain was somewhat superior to the other lot as regards appearance and this, in the author's opinion, constituted the only advantage of the grain ration.

The feeding value of a mixture of peas and barley was tested with 3 pigs for a period covering 92 days, "which is about 30 days longer than is usually advisable to feed for economical results." The total gain made was 475 lbs., 7.1 lbs. of grain being required per pound of gain.

Six tests with an aggregate of 28 pigs of mixed breeding and various ages are reported in which wheat, whole and ground, alone and as part of a mixed ration, was studied, as well as the comparative value of wheat, peas, corn, barley, and barley and potatoes. Skim milk was also fed in some cases.

According to the author the best results were obtained with wheat, 4.48 lbs. being required on an average to produce a pound of gain. In the first half of the fattening period 3.81 lbs. was required per pound of gain, as compared with 5.12 lbs. in the last half. In other words, "the heavily larded hog resultant from a long period of feeding is much more costly to produce than the block hog, or the bacon type. . . . Results also indicate that a bushel of wheat properly fed to reasonably well-bred hogs should produce approximately 13.5 lbs. of live pork."

Tests on the comparative value of boiled clover hay and clover silage and cooked and uncooked grain have been noted from another publication (E. S. R., 13, p. 680).

Feeding trials with pigs (*Wisconsin Sta. Rpt. 1903, pp. 82–91*).—The following experiments on the feeding and management of pigs are summarized and discussed: Feeding Pigs for the Production of Lean and Fat Meat, by W. L. Carlyle (E. S. R., 13, p. 78); Effect of Feeding Various Grain Rations to Growing and Fattening Hogs,

by W. L. Carlyle and T. F. McConnell (E. S. R., 13, p. 979); The Result of a Feeding Trial to Determine the Comparative Effect of Feeding Pigs Rations of Corn Meal and of Ground Peas, by W. L. Carlyle (E. S. R., 13, p. 980); Results of an Experiment to Determine the Comparative Effect upon the Growth, Development, and Character of the Carcass of Pigs Fed upon Rations of Ground Peas and Corn Meal, by W. L. Carlyle and T. F. McConnell (E. S. R., 14, p. 999); The Result of a Feeding Trial Comparing Razorback with Cross-Bred Razorback and Improved Breeds of Hogs, by W. L. Carlyle (E. S. R., 14, p. 1000); and Canker Sore Mouth in Young Pigs, by W. L. Carlyle.

It is stated that the most important feature of these investigations was the experiments undertaken to determine the relative value of different rations for the production of fat and lean, since the market demands pork with a large percentage of lean meat. Rations with a high protein content, it is stated, were more conducive to the development of the internal organs of the pigs than the rations low in protein, and also to a distribution of a greater amount of lean with the fat in the carcasses.

Whole corn compared with corn meal for fattening pigs, W. A. Henry (*Wisconsin Sta. Rpt. 1903, pp. 43–45*).—Experiments previously reported (E. S. R., 14, p. 999) on the comparative value of whole and ground corn for fattening pigs are summarized. On an average 105 pigs required 5.16 lbs. of feed per pound of gain on a ration of dry shelled corn and middlings, as compared with 4.8 lbs. required by an equal number on a ration of corn meal and middlings.

In other words, there was "a saving of 36 lbs. of feed for each 100 lbs. of gain made by the hogs. This shows a gain by grinding the corn to meal of 6.9 per cent, or, say, 7 per cent in round numbers. While the direct advantage from grinding corn to meal was about 7 per cent, in these experiments there was a second advantage secured in that the hogs getting corn meal made more rapid gains than those fed shelled corn."

Feeding draft horses for the market, J. W. Coverdale (*Iowa Agr., 4 (1904), No. 6, pp. 238–240*).—On the basis of experience the author considers that the essential points in feeding draft horses for the market are "the selection for type and constitutional vigor, the careful starting on grains, the ration at full feed, toning up of his system, the place in which he is fed, the care of the stable, the grooming, exercise and training before selling." A corn ration is recommended at first, with a little oats once a day with a sprinkling of bran, and later these feeds in increasing amounts.

"Corn had best be given in the ear by itself. It may be fed morning and evening. A handful of flax meal should be fed just after watering in the morning. Oats and bran mixed make a good feed for dinner. The amount of each feed should be according to the appetite of the horse. Some horses eat more than others. However, a heavy horse on full feed will eat about 18 ears of corn twice a day; 15 qt. of oats and bran mixed, and about 10 lbs. of hay." The hay, it is said, should be given in small amounts 5 times per day.

Poultry experiments, C. Curtice (*Rhode Island Sta. Rpt. 1903, pp. 269–273*).—During the year the poultry work of the station has been principally with the incubation and brooding of chickens. In the incubation experiments 8,677 eggs have been set in incubators. Of these, 83 per cent were fertile, and 46 per cent of the fertile eggs, or 38.6 per cent of the total number of eggs, hatched, the efficiency of hatching under various conditions ranging from 0 to 84 per cent.

Owing to unfavorable circumstances the brooding experiments were not considered satisfactory. "The results have varied from 100 per cent downward." The other poultry work at the station and plans for future studies are very briefly spoken of.

Cooperative experiments in poultry raising, W. R. Graham (*Ontario Agr. and Expt. Union Rpt. 1903, pp. 40–42*).—A brief account with discussion of cooperative experiments on hatching chickens with incubators.

Poultry keeping for farmers, A. M. PRAIN (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 62–74, figs. 12*).—Breeds of poultry, feeding, marketing, testing eggs, housing, and other topics are discussed.

DAIRY FARMING—DAIRYING.

Distillery and brewery by-products, J. B. LINDSEY (*Massachusetts Sta. Bul. 94, pp. 28, fig. 1*).—Distillers' grains, brewers' grains, and malt sprouts are described, and digestion and feeding experiments with these products are reported.

The dried distillers' grains used in the experiments showed the following composition: Water 9.75, ash 1.54, protein 35.36, fiber 12.97, extract matter 29.74, and fat 10.64 per cent. The coefficients of digestibility, as determined in experiments with sheep, were as follows: Dry matter 73, protein 71, fiber 77, extract matter 70, and fat 95 per cent. The average composition and digestibility of a number of samples are also given.

In an experiment with 6 cows, lasting 12 weeks, the distillers' grains were compared with Buffalo gluten feed. The gain in live weight of the cows and the yield of milk and butter were slightly in favor of the distillers' grains, though the differences were not large. The cost of food was also in favor of the distillers' grains. When the cows were fed the gluten meal, from 4 to 6 per cent more dry matter and from 7 to 9 per cent more digestible matter were required to produce milk, solids, and fat than when distillers' grains were fed. Distillers' grains are, therefore, believed to be fully equal, if not superior, to gluten feed in nutritive value, and without injurious effect on the health of the animals.

No objectionable flavor or odor was detected in the milk of cows fed distillers' grains, and neither was the keeping quality of the milk apparently affected in any way. The chief use of distillers' grains is for dairy cows, and for this purpose 2 to 4 lbs. mixed with other grains may be fed daily. Several combinations are suggested.

The dried brewers' grains used showed the following composition: Water 14.06, ash 3.22, protein 23.26, fiber 14.58, extract matter 38.82, and fat 6.06 per cent; and the following coefficients of digestibility: Dry matter 61, protein 82, fiber 47, extract matter 56, and fat 88 per cent. Average analyses and digestibility are also reported.

This material was compared with wheat bran in a feeding experiment with 8 cows. The gain in live weight and yield of milk was slightly in favor of the brewers' grains. The ration containing brewers' grains was slightly more economical. Very little difference was observed in the dry matter and digestible matter required to produce solids and fat. As before, the brewers' grains exerted no unfavorable influence on the flavor and keeping quality of the milk. In feeding brewers' grains to dairy cows it is believed to be preferable to mix them with other grains, and to feed from 2 to 5 lbs. daily. Several rations are suggested. Notes are also given on feeding wet brewers' grains. It is believed 25 lbs. is a fair daily allowance for average sized cows.

The malt sprouts tested showed the following composition: Water 10.68, ash 4.40, protein 25.33, fiber 14.57, extract matter 43.96, and fat 1.06 per cent; and the following coefficients of digestibility, as determined in experiments with sheep: Dry matter 78, protein 76, fiber 102, extract matter 78, and fat 60 per cent.

This material was compared with gluten feed in an experiment with 4 cows, lasting 6 weeks. The gain in live weight and the yield of milk were slightly in favor of the gluten feed. It is believed that malt sprouts may constitute one-third of the daily grain ration, and at the price usually asked may be regarded as an economical feeding stuff. Several rations are suggested.

The following general statements are made concerning the relative value of the several feeding stuffs:

"Distillers' dried grains with 32 per cent or more protein are fully equal if not rather superior to gluten feed in feeding value. Distillers' grains and gluten feed

are worth fully one-half as much again as wheat bran. Brewers' dried grains and malt sprouts do not vary greatly in feeding value; the former will generally be given the preference. Brewers' grains and malt sprouts are rather superior in feeding value to wheat bran, probably 10 per cent."

Records of a dairy herd for five years, C. L. BEACH (*Connecticut Storrs Sta. Bul. 29, pp. 32, figs. 18*).—Individual records are given of 17 to 25 cows each year for 5 years. In all, records were obtained of 50 different cows, the total number of lactation periods being 103. The average annual production of milk for the 5 years was 5,498 lbs., and the average production of butter 326 lbs. The kind and amount of food was much the same during the entire period. The increase in the net profits from a loss of $1.23 in 1899 to a profit of $21.69 per cow in 1903 is attributed to the selection of animals better suited to dairy purposes.

The cows were classified as regards type into the dairy group, cows lacking digestive capacity, and the fleshy group, the average profits of the 3 types being, respectively, $28.09, $5.81, and $6.09. As regards the profits from butter fat, the Jerseys made the best showing; but as regards the profits from milk, a much better record was made by the Holstein breed. On an average the maximum yield of milk was obtained during the third week of lactation. The fat content of the milk increased about 0.1 per cent each month during the first 10 months of lactation.

Experiments in feeding and management of dairy cows (*Wisconsin Sta. Rpt. 1903, pp. 92–105*).—This is a summary of the following articles previously published by the station: One Hundred American Rations for Dairy Cows, by F. W. Woll (E. S. R., 5, p. 884); On the Comparative Value of Linseed Meal, Corn Meal, and Wheat Bran for Milch Cows, by F. W. Woll (E. S. R., 8, p. 335); On the Economy of Heavy Grain Feeding of Dairy Cows, I, by F. W. Woll and W. L. Carlyle (E. S. R., 12, p. 81); On the Economy of Heavy Grain Feeding of Dairy Cows, II, by F. W. Woll and W. L. Carlyle (E. S. R., 13, p. 80); Dairy Herd Record, by W. L. Carlyle (E. S. R., 12, p. 83); Record of the University Dairy Herd, by W. L. Carlyle (E. S. R., 13, p. 81); Studies in Milk Production, by W. L. Carlyle (E. S. R., 15, p. 502); The Effect on Dairy Cows of Changing Milkers, by W. L. Carlyle (E. S. R., 12, p. 83), and Protecting Cows from Flies, by W. L. Carlyle (E. S. R., 12, p. 82).

Tests of dairy cows (*Wisconsin Sta. Rpt. 1903, pp. 114–117*).—This is a summary of the following articles, previously published by the station: Tests of the Guernsey Cow Suke of Rosendale (6520 G. H. B.), by F. W. Woll (E. S. R., 10, p. 782); Tests of Dairy Cows, by J. W. Decker (E. S. R., 8, p. 336; 11, p. 587); Tests of Dairy Cows, 1898–99, by J. W. Decker (E. S. R., 12, p. 90); Official Tests of Dairy Cows, 1899–1900, by F. W. Woll (E. S. R., 13, p. 81); Official Tests of Dairy Cows, 1900–1901, by F. W. Woll and R. H. Shaw (E. S. R., 13, p. 986); Official Tests of Dairy Cows, 1901–2, by F. W. Woll (E. S. R., 14, p. 1007), and Official Tests of Dairy Cows, 1902–3, by F. W. Woll (E. S. R., 15, p. 1000).

Testing cows at the farm (*Wisconsin Sta. Rpt. 1903, pp. 106–113*).—This is a summary of two articles by E. H. Farrington entitled: Annual Milk and Butter Production of Cows Owned by Patrons of the University Creamery (E. S. R., 13, p. 985), and Testing Cows at the Farm (E. S. R., 11, p. 673).

Dairy observations, C. L. BEACH (*Connecticut Storrs Sta. Bul. 28, pp. 20, figs. 7*).—This consists of reprints of 3 articles from the last annual report, namely, Dehorning Cattle (E. S. R., 15, p. 905), Milking Records (E. S. R., 15, p. 905), and the Food Cost of Raising Calves (E. S. R., 15, p. 893).

Standard milk, F. W. MORSE (*New Hampshire Sta. Bul. 103, pp. 79–82*).—This is a brief discussion of the composition of milk with special reference to the requirements of the New Hampshire law, which is quoted. As a means of meeting the requirements of the law the careful selection and testing of cows is urged. To aid farmers in this respect the station offers to make determinations of fat for 10 cts. per sample, and total solids for 25 cts. per sample. Brief directions are given for sampling.

Determinations of the fat content of milk produced by cows of different breeds, R. GRIPENBERG (*Landtbr. Styr. Meddel. [Helsingfors], 1903, No. 44, pp. 36–52, 57–63, 81–94*).—These investigations were conducted with pure-bred cows of the Ayrshire, Holstein, and Finnish breeds, together with some cross-bred cows, for a period of 5 years, 1896–1900. Tabular statements of the fat determinations are given, and the results are briefly discussed.—F. W. WOLL.

Milk, G. TIMEUS (*Abs. in Chem. Centbl., 1904, I, No. 3, p. 202*).—Milk hygiene is discussed with special reference to the feeding of infants. It is reported that in Trieste analyses of market milk made during a period of 3 years showed that more or less cream had been removed from 78 per cent of the samples examined, and that some samples contained only 0.5 per cent of fat.

The animal odor and the aromatic substances in milk, J. E. HAUGAN (*Landmandsblade, 37 (1904), No. 5, pp. 66–69*).

On the principal micro-organisms in milk and their importance in dairying, E. PETERSSON (*Nord. Mejeri Tidn., 19 (1904), No. 20, pp. 267–269*).

On "Buddeizing" of milk (*Nord. Mejeri Tidn., 19 (1904), No. 10, pp. 123–128*).—Refers to the method of preserving milk by means of hydrogen peroxid, proposed by Budde (E. S. R., 14, p. 1005). Hygienic and therapeutic properties are claimed for the milk preserved by this method.—F. W. WOLL.

Investigations of the relation between the specific gravity and fat content of the cream and the yield of butter obtained from the same, R. GRIPENBERG (*Landtbr. Styr. Meddel. [Helsingfors], 1903, No. 44, pp. 63–81*).—The method of payment of cream delivered to creameries according to volume or weight is not found sufficiently correct on account of the large variations in the fat content of the cream.

The author discusses the various factors that influence the concentration of the cream, and gives the results of trials showing that even in creameries where the separator is run by a well-regulated steam engine furnishing ample power, the fat content of the cream will vary between 16 and 26 per cent. In 78 per cent of the observations made the fat content varied between 19 and 24 per cent. The author recommends weighing the cream in making Babcock tests, and by means of a simple formula calculates the yield of butter from certain quantities of cream of different richness, and the price to be paid for the same, with the price of butter ranging between ordinary limits.

The following table shows the relation between the specific gravity of the cream at 15 and 60° C., the percentage of fat in the cream, and the yield of butter per 100 kilograms of cream:

Yield of butter in relation to specific gravity and fat content of cream.

Specific gravity of cream.		Per cent fat in cream.	Kg. butter from 100 kilos cream.
15° C.	60° C.		
1.0160	0.9955	17.5	21.1
1.0154	.9948	18.0	21.3
1.0146	.9940	18.5	21.9
1.0143	.9934	19.0	22.6
1.0140	.9928	19.5	23.4
1.0135	.9923	20.0	23.9
1.0131	.9915	20.5	24.4
1.0127	.9912	21.0	24.8
1.0123	.9906	21.5	25.2
1.0120	.9903	22.0	25.7
1.0116	.9901	22.5	26.2
1.0112	.9890	23.0	26.9
1.0107	.9881	23.5	27.5
1.0104	.9878	24.0	27.8
1.0100	.9875	24.5	27.9

—F. W. WOLL.

Experiments with the "Radiator," R. GRIPENBERG (*Landtbr. Styr. Meddel.* [*Helsingfors*], *1903*, *No. 44*, *pp. 52-57*).—The construction of this combined cream separator and churn is described, and the results of comparative trials with the radiator and with separators and churns are given, showing that the yield of butter is nearly the same in both cases.—F. W. WOLL.

Preservation of milk for direct use by pasteurization (*Wisconsin Sta. Rpt. 1903*, *pp. 177-182*).—This is a summary of the following articles previously published by the station: Pasteurization of Milk and Cream for Direct Consumption, by H. L. Russell (E. S. R., 7, p. 987); Bacteriological Investigations on Pasteurized Milk and Cream, H. L. Russell (E. S. R., 8, p. 722); Pasteurization of Milk and Cream at 140° F., by E. H. Farrington and H. L. Russell (E. S. R., 12, p. 84); Thermal Death Point of Tubercle Bacilli under Commercial Conditions, by H. L. Russell and E. G. Hastings (E. S. R., 13, p. 83), and Increased Resistance of Bacteria in Milk Pasteurized in Contact with Air, by H. L. Russell and E. G. Hastings (E. S. R., 13, p. 986).

Conditions affecting the consistency of milk; means of restoring consistency of pasteurized cream (*Wisconsin Sta. Rpt. 1903*, *pp. 183-187*, *figs. 2*).—This is a summary of the following articles previously published by the station: Effect of Pasteurization and Sterilization on the Viscosity and Fat Globules of Milk and Cream, by F. W. Woll (E. S. R., 8, p. 723); Conditions Affecting the Consistency of Milk, by S. M. Babcock and H. L. Russell (E. S. R., 9, p. 582); Restoration of the Consistency of Pasteurized Milk and Cream, by S. M. Babcock and H. L. Russell (E. S. R., 9, p. 583), and Restoration of the Consistency of Pasteurized Cream, by S. M. Babcock and H. L. Russell (E. S. R., 9, p. 181).

Dairy bacteriological problems (*Wisconsin Sta. Rpt. 1903*, *pp. 231-240*, *figs. 2*).—This is a summary of the following articles previously published by the station: Sources of Bacterial Contamination of Milk, by H. L. Russell (E. S. R., 8, p. 340); Relative Absorption of Odors in Warm and Cold Milk, by H. L. Russell (E. S. R., 11, p. 581); Tainted or Defective Milks; Their Causes and Methods of Prevention, by H. L. Russell (E. S. R., 9, p. 990), and Influence of Sugar on Nature of Fermentations in Milk and Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and E. G. Hastings (E. S. R., 13, p. 989).

Galactase, the inherent digestive enzym of milk (*Wisconsin Sta. Rpt. 1903*, *pp. 201-205*).—This is essentially a summary of the following articles previously published by the station: Unorganized Ferments of Milk; a New Factor in Cheese Ripening, by S. M. Babcock and H. L. Russell (E. S. R., 10, p. 785); Properties of Galactase, a Digestive Ferment of Milk, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 11, p. 578); Distribution of Galactase in Cow's Milk, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 11, p. 579); Distribution of Galactase in Milk of Different Species of Mammalia, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 11, p. 579), and Action of Proteolytic Ferments on Milk with Special Reference to Galactase, the Cheese-Ripening Enzym, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 12, p. 87).

Methods and apparatus for testing milk and milk products (*Wisconsin Sta. Rpt. 1903*, *pp. 118-182*, *pls. 3*, *figs. 8*).—Numerous articles previously published by the station are summarized under the following subheadings:

The Babcock milk test (pp. 118-131).—A Comparison of the Babcock Test and the Gravimetric Method of Estimating Fat in Skim Milk, by E. H. Farrington (E. S. R., 9, p. 589); A Source of Error in Some Turbine Testers, by F. W. Woll (E. S. R., 13, p. 83); Influence of Temperature on Test of Skim Milk by Babcock Test, by E. H. Farrington (E. S. R., 13, p. 83); Estimation of Fat in Sweetened Condensed Milk by Babcock Test, by E. H. Farrington (E. S. R., 13, p. 83); Calculating Dividends for Milk and for Cream at the Same Factory, by E. H. Farrington (E. S. R., 13, p. 84); The Trowbridge Method of Calibrating Babcock Test Bottles, by E. H.

Farrington (E. S. R., 13, p. 986), and A Modified Cream Test Bottle, by E. H. Farrington (E. S. R., 14, p. 1010).

Wisconsin curd test (pp. 132–134).—Factory Tests for Milk, by S. M. Babcock, H. L. Russell, and J. W. Decker (E. S. R., 10, p. 385), and Improved Curd Test for Detection of Tainted Milks, by S. M. Babcock, H. L. Russell, and J. W. Decker (E. S. R., 11, p. 599).

Alkaline tablet test (pp. 134–142).—Alkaline Tablet Test of Acidity in Milk and Cream, by E. H. Farrington (E. S. R., 8, p. 933; 9, p. 589).

Investigation of creamery problems (pp. 143–156).—Effect of Salt on the Water Contents of Buttĕr, by E. H. Farrington (E. S. R., 12, p. 86); White Spots on Butter, by E. H. Farrington (E. S. R., 12, p. 87); Pasteurization of Skim Milk, by E. H. Farrington (E. S. R., 12, p. 85); Columbia Air Churn, by E. H. Farrington and F. Dewhirst (E. S. R., 13, p. 84); Composition of Frozen Milk, by E. H. Farrington (E. S. R., 14, p. 1010); Score of Butter as Affected by Size of Package, by E. H. Farrington (E. S. R., 11, p. 599); Difficulties in the Way of Drawing Conclusions from Scores of Butter When Based on One Judge's Scores, by E. H. Farrington (E. S. R., 14, p. 1011), and Power Tests of Cream Separators, by A. W. Richter (E. S. R., 8, pp. 170, 732).

Miscellaneous dairy investigations (pp. 156–165).—The Fat Globules in Cows' Milk, by F. W. Woll (E. S. R., 8, p. 337); On the Average Composition of Milk of Pure-Bred Cows of Different Breeds, by F. W. Woll (E. S. R., 13, p. 985); Investigations of Methods of Milking, by F. W. Woll (E. S. R., 14, pp. 694, 1007); Examination of Dairy Salt, by F. W. Woll (E. S. R., 11, p. 585; 12, p. 91); A Composite Milk Sampling Pipette, by J. W. Decker (E. S. R., 12, p. 91); A Comparison of Reagents for Milk Proteids, with some Notes on the Kjeldahl Method of N Determinations, by A. Vivian (E. S. R., 12, p. 19), and A Rapid Method of Estimating Salt in Butter, by A. Vivian (E. S. R., 13, p. 16).

Statistical investigations relating to the dairy industry (pp. 165, 166).—Statistics from 52 Wisconsin Separator Creameries, by E. H. Farrington (E. S. R., 9, p. 286; 10, p. 792); Statistical Data Relative to the Cheese Industry of Wisconsin, by J. W. Decker (E. S. R., 10, p. 790); Distribution of Cheese Factories in Wisconsin, by S. M. Babcock, H. L. Russell, and J. W. Decker (E. S. R., 10, p. 792); The Cheese Industry: Its Development and Possibilities in Wisconsin, by S. M. Babcock and H. L. Russell (E. S. R., 9, p. 387), and The Dairy Industry in Wisconsin with Wall Map Showing Distribution of Creameries and Cheese Factories in 1901, by H. L. Russell (E. S. R., 13, p. 690).

The fat testing of cream by the Babcock method, E. H. WEBSTER (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 58, pp. 29, pls. 2, fig. 1*).—Investigations in creameries in several western States revealed, according to the author, some surprising facts in regard to the general practice of handling the Babcock method in cream testing.

"Men who used the test daily were found to be at fault in many particulars, and in some instances not the first idea of the principle underlying the method seemed to be in the mind of the operator." This is attributed in part to carelessness on the part of the operator, and in part to improper instruction given for the use of the Babcock test as applied to cream.

This bulletin describes the manipulation of the test in detail, including the results of original tests, notes concerning faults which have been observed, and suggestions as to better methods. The three vital points in making the test, (1) a true sample of the cream to be tested, (2) an exact quantity of the sample in the test bottle, and (3) reading the test accurately, are described in the order mentioned, and condensed directions for making fat tests of cream are presented in the form of a summary to the bulletin.

Pasteurization as applied to butter making (*Wisconsin Sta. Rpt. 1903, pp. 167-176*).—This is a summary of the following articles previously published by the station: Use of Bacterial Culture Starters in Butter Making with Especial Reference to the Conn Culture (B41), by E. H. Farrington and H. L. Russell (E. S. R., 8, p. 732); The Conn Culture (B41) in Butter Making, by E. H. Farrington and H. L. Russell (E. S. R., 8, p. 261); Pasteurization Experiments in Butter Making, by E. H. Farrington and H. L. Russell (E. S. R., 10, p. 889; 11, p. 599), and Pasteurized Cream Butter, by E. H. Farrington and J. H. Godfrey (E. S. R., 14, p. 1011).

"During the past year it has been shown that sour cream may be successfully pasteurized, and at the present time there are indications that unless the sour cream contains over 30 per cent fat the pasteurizing of it brings about conditions by which a rich buttermilk is obtained when such cream is churned. A rich, sour cream may be pasteurized and churned without an excessive loss of butter in the buttermilk, but a thin, sour cream containing in the neighborhood of 20 per cent fat, when pasteurized and churned sometimes leaves too much fat in the buttermilk, and on this account may diminish the yield of butter somewhat. A further investigation of this point in regard to the pasteurization of sour cream is very much needed."

A brief history of butter production in Denmark, M. P. BLEM (*Mälkeritid., 16 (1903), No. 52, pp. 919-925*).

Final report of the committee on butter regulations, H. C. PLUNKETT ET AL. (*London: Wyman & Sons, Ltd., 1903, pp. 28*).—This committee, consisting of 10 members, was appointed by the Board of Agriculture and the Department of Agriculture and other Industries, and Technical Instruction for Ireland, for the purpose of determining what deficiency in any of the normal constituents of butter, or what addition of extraneous matter, or what proportion of water in any sample of butter shall, for the purpose of the Sale of Food and Drugs Acts, raise a presumption, until the contrary is proved, that the butter is not genuine.

In a previous report the adoption of the limit of 16 per cent of water was recommended. In the present report it is recommended (1) "That the figure 24 arrived at by the Reichert-Wollny method should be the limit below which a presumption should be raised that butter is not genuine; (2) that the use of 10 per cent of sesame oil in the manufacture of margarin be made compulsory; and (3) that steps should be taken to obtain international cooperation." Appended to the report are notes of reservation of several members of the committee, and also a description of the Reichert-Wollny method.

The minutes of evidence presented to this committee, and upon which this report is based, have been published in a separate volume of 660 pages.

Special series of cheese bulletins (*Wisconsin Sta. Rpt. 1903, pp. 220-225, fig. 1*).—This is a summary of the following bulletins of the station: The Cheese Industry: Its Development and Possibilities in Wisconsin, by S. M. Babcock and H. L. Russell (E. S. R., 9, p. 387); The Constitution of Milk with Especial Reference to Cheese Production, by S. M. Babcock (E. S. R., 9, p. 888); Tainted or Defective Milks: Their Causes and Methods of Prevention, by H. L. Russell (E. S. R., 9, p. 990); Factory Tests for Milk, by S. M. Babcock, H. L. Russell, and J. W. Decker (E. S. R., 10, p. 385); Construction of Cheese Curing Rooms for Maintaining Temperatures of 58 to 68° F., by F. H. King (E. S. R., 11, p. 186); Dairy Industry in Wisconsin, with wall map, by H. L. Russell (E. S. R., 13, p. 690); Curing of Cheddar Cheese with Especial Reference to Cold Curing, by S. M. Babcock and H. L. Russell (E. S. R., 14, p. 490); Consolidated Cheese Curing Stations, by S. M. Babcock and H. L. Russell (E. S. R., 14, p. 490), and Shrinkage of Cold Cured Cheese During Ripening, by S. M. Babcock, H. L. Russell, and U. S. Baer (E. S. R., 15, p. 509).

Experimental work on methods of cheese manufacture (*Wisconsin Sta. Rpt. 1903, pp. 188-192, fig. 1*).—This is a summary of the following articles previously published by the station: Effect of Aeration on Flavor of Tainted Curds in Cheese

Making, by H. L. Russell (E. S. R., 8, p. 728); Influence of Acid on Texture of Cheese, by H. L. Russell and J. W. Decker (E. S. R., 8, p. 728); Hot-Iron Test, by S. M. Babcock (E. S. R., 8, p. 728); Albumen Cheese, by S. M. Babcock (E. S. R., 8, p. 728); Print Cheese, by E. H. Farrington (E. S. R., 13, p. 990); Ripening Milk Before Setting, by J. W. Decker (E. S. R., 8, p. 730); Effect of Varying Strengths of Rennet in Curdling Milk, by J. W. Decker (E. S. R., 11, p. 580); Action of Rennet in Watered Milk, by J. W. Decker (E. S. R., 11, p. 581); Action of Common Salt on Rennet Action, by J. W. Decker (E. S. R., 11, p. 584); Effect of Salt upon Cheese, by J. W. Decker (E. S. R., 8, p. 342), and Methods of Handling Sour Milk in Making Cheese, by J. W. Decker (E. S. R., 11, p. 585).

Bacteriology of cheese (*Wisconsin Sta. Rpt. 1903, pp. 226–230*).—This is a summary of the following articles: Gas-Producing Bacteria and Their Relation to Cheese, by H. L. Russell (E. S. R., 8, p. 730); Rise and Fall of Bacteria in Cheddar Cheese, by H. L. Russell (E. S. R., 9, p. 586); Pure Lactic Acid Cultures in Cheese Making, by H. L. Russell (E. S. R., 9, p. 587), and Effect of Digesting Bacteria on Cheese Solids, by H. L. Russell and V. H. Bassett (E. S. R., 12, p. 89).

Investigations regarding the curing of cheese (*Wisconsin Sta. Rpt. 1903, pp. 193–200*).—This contains a summary of the following articles previously published by the station: Unorganized Ferments of Milk; a New Factor in Cheese Ripening, by S. M. Babcock and H. L. Russell (E. S. R., 10, p. 785); Action of Proteolytic Ferments on Milk with Special Reference to Galactase, the Cheese-Ripening Enzym, by S. M. Babcock, H. L. Russell, A. Vivian, and E. G. Hastings (E. S. R., 12, p. 87); Influence of Galactase on Ripening of Cottage Cheese, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 12, p. 88); Influence of Rennet on Cheese Ripening, by S. M. Babcock, H. L. Russell, and A. Vivian (E. S. R., 13, p. 87), and Influence of Varying Quantities of Rennet on Cold Cured Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (E. S. R., 14, p. 1012).

Some general conclusions regarding causes operative in Cheddar cheese ripening are stated as follows: "The earlier views as to the action of bacteria referred the main part of the work of digestion to the activity of liquefying bacteria. These organisms are capable of producing proteolytic enzyms, which digest the casein of milk with the formation of decomposition products, ranging from albumoses to the more ultimate product, ammonia. Numerous observations show that this type of bacteria occurs only sparingly in ripening Cheddar cheese, and it is difficult to believe that the exceedingly small quantities of digestive enzyms which would be produced can exert any considerable influence in the ripening process.

"As a normal cheese ripens, ammonia is always found, and the origin of this substance can not be attributed to either galactase or pepsin. Hence it seems probable that the activity of living organisms must be invoked to explain the origin of this product, but with the data at hand we are unable to state definitely what types of organisms are concerned.

"From our present knowledge the factors above mentioned are the chief agents which are operative in the ripening changes that occur in cheese. The initial changes are inaugurated by the lactic-acid bacteria which produce acid that unites with the paracasein forming a compound, paracasein monolactate, soluble in dilute salt solutions. This acid also supplies, even when combined with casein, the optimum conditions for the peptic digestion produced by rennet.

"The activity of galactase is undoubtedly operative from the beginning and continuous throughout the life of the cheese. The same is true of the pepsin in the rennet extract, which under certain conditions is probably the main factor in breaking down the casein of the cheese. It is exceedingly difficult, however, to assign to each of these agents the exact amount of proteolytic activity which it performs. Undoubtedly, the effect of environmental conditions (variation in acidity, temperature, etc.) determine somewhat the relative value of each.

"From our present knowledge of the processes which occur in the breaking down of the casein, we may consider that it has been definitely proven that the real digestive changes are almost, if not wholly, attributable to the action of proteolytic enzyms, and that bacteria play an insignificant rôle in this process, except so far as they prepare the way, by virtue of the acid which they form, for the subsequent changes which take place in the casein."

Cold curing of cheese (*Wisconsin Sta. Rpt. 1903, pp. 206–216, fig. 1*).—This is a summary of the following articles previously published by the station: Influence of Temperature on Ripening of Cheese, by S. M. Babcock and H. L. Russell (E. S. R., 10, p. 787); Influence of Cold Curing on Quality of Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (E. S. R., 13, p. 988); Influence of Cold Curing on Quality of Cheddar Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (E. S. R., 14, p. 1011); Curing of Cheddar Cheese with Reference to Cold Curing, by S. M. Babcock and H. L. Russell (E. S. R., 14, p. 490); The Cold Curing of Cheese. Report of experiments published as Bulletin 49, Bureau of Animal Industry, U. S. Department of Agriculture, in cooperation with New York [State] Agricultural Experiment Station, by S. M. Babcock, H. L. Russell, and U. S. Baer; Shrinkage of Cold Cured Cheese, by S. M. Babcock, H. L. Russell, and U. S. Baer (E. S. R., 15, p. 509); Conditions Affecting Development of White Specks in Cold Cured Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (E. S. R., 14, p. 1012), and Influence of Temperature Approximating 60° F. on Development of Flavor in Cold Cured Cheese, by S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (E. S. R., 14, p. 1012).

Experiments in paraffining cheese (*Wisconsin Sta. Rpt. 1903, pp. 217–219, fig. 1*).—This is a summary of the following articles previously published by the station: Coating Cheese with Paraffin, by J. W. Decker (E. S. R., 12, p. 91), and Experiments on Paraffining Cheese (see bulletin on Shrinkage of Cold Cured Cheese), by S. M. Babcock, H. L. Russell, and U. S. Baer (E. S. R., 15, p. 509).

Canning cheese, E. F. Pernot (*Oregon Sta. Bul. 78, pp. 8*).—This is a report on experimental work in canning cheese. The fresh milk as received at the dairy was inoculated with pure cultures and later treated according to the usual Cheddar process. Tin cans of various sizes were thoroughly cleansed and coated on the inside with paraffin.

In the earlier experiments the curd was placed in the cans and subjected to pressure. The best results were obtained by milling and canning one-half hour after salting. Less than the usual amount of salt was required. In the later experiments the curd was pressed in hoops, in the regular manner, and afterwards placed in cans of the same size. In all cases the cans were sealed hermetically immediately after being filled. Lots of from 6 to 15 cans were filled at a time and opened at regular intervals for examination.

"The first can was opened 6 weeks after being filled, and the cheese, for its age, was well ripened, of an excellent flavor and odor, the texture was friable, delicate, and quite superior to that of any other cheese. Several cans were opened at each of the various times, and a gradual increase of the delicate flavor was noticeable, but even in a can 1 year old it did not become strong and rank. There seemed to be a limit reached in the ripening, after which it remained unchanged. Very naturally there was no rind, no mold, and no loss in weight through evaporation; a pound of curd produced a pound of cheese."

The cans were placed in an ordinary room where the temperature rose in two instances to 80 and 100° F. The higher temperatures ruined all the cheeses that were in the different stages of curing. "After 3 months' curing change of temperature seemed to have no bad effect, but by far the most satisfactory results were obtained from cheese which was cured at a constant temperature of 60° F."

In order to test the shipping qualities of canned cheese, 1-lb. cans were sent by mail to China and return, and by express to England and return, and also to various points in the United States. It is reported that the cheese was uninjured by the shipping. It is stated, however, that cheese must be reasonably well cured before being subjected to the extreme changes of temperature incident to shipping long distances.

A study was also made of several pure cultures used to inoculate fresh milk which was subsequently made into cheese. A marked difference was observed in the flavor produced by different cultures. Four cultures were secured which gave good results. Bacteriological examinations made at the time of canning and when the cans were opened showed a material decrease in the number of bacteria.

The work, which has covered a period of nearly 2 years, is believed to have demonstrated the possibility and practicability of controlling the flavor of cheese by the use of pure cultures. Several lots of cheese made without previously inoculating the milk turned out very well.

The cheese industry in Franche-Comté, L. Macoir (*Bul. Agr. [Brussels], 20 (1904), No. 3, pp. 377-441, figs. 10*).—The methods employed in the manufacture of Camembert, Brie, Gruyère, Port-salut, and Septmoncel cheese are described in considerable detail, and an account is given of dairy instruction, dairy societies, milk control, etc., in this province of France. The author believes that the different kinds of cheese mentioned can be manufactured with equally good results in Belgium.

Annual report of the experiment station for cheese making at Lodi, 1903 (*Ann. R. Staz. Sper. Caseif. Lodi, 1903, pp. 76, fig. 1*).—This contains the usual review of the work of the station during the year, an account of the international dairy congress at Belgium, a discussion of the composition and nutritive value of whey, experiments in the manufacture of cheese from pasteurized milk, notes on a case of gassy cheese and on a milk filter, and the results of experiments on the use of pure cultures of lactic-acid bacteria in the ripening of cream.

Twenty-seventh annual report of the Iowa State Dairy Convention, 1903 (*Ann. Rpt. Iowa State Dairy Conv., 27 (1903), pt. 5, pp. 334*).—Addresses on the selection and feeding of cows, construction and use of silos, food value of feeding stuffs, butter making, cream ripening, handling and care of milk and cream, and other topics are included in the report.

Missouri State Dairy Association (*Ann. Rpt. Missouri State Bd. Agr., 36 (1903), pp. 90-139, pl. 1, figs. 3*).—This is a summary of the addresses delivered before the annual meeting of the association held in December, 1903.

Report of the thirty-fourth annual meeting of the Vermont Dairymen's Association, 1904 (*Rpt. Vermont Dairymen's Assoc., 34 (1904), pp. 156*).—This report contains rules for dairymen, as formulated by the association, and the addresses presented at the annual meeting, included Good Cheese and How to Make It, by J. W. Decker; The Vermont Dairy School, by J. L. Hills; and Dairy and Food Legislation, by H. C. Adams. Other matters of interest are also included in the report.

Officials, associations, and educational institutions connected with the dairy interests of the United States for the year 1904 (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 44, pp. 12*).

VETERINARY SCIENCE AND PRACTICE.

Toxins and antitoxins, C. Oppenheimer (*Toxine und Antitoxine. Jena: Gustav Fischer, 1904, pp. 228*).—The purpose of this volume is to present a systematic account of all toxins of whatever nature and origin. Each toxin and its antitoxin is described in considerable detail. The subject-matter is classified according to its nature and includes a general discussion of toxins, the relation of toxins to antitoxins, true toxins, endotoxins and other bacterial poisons, plant toxins, and animal toxins.

Collected works relating to the problem of immunity, P. EHRLICH (*Gesammelte Arbeiten zur Immunitätsforschung. Berlin: August Hirschwald, 1904, pp. XII+776, figs. 12*).—In this book the editor has brought together the majority of the articles on immunity published by himself and associates during the last few years. The volume contains 38 articles dealing with various phases of immunity and serving to develop and elucidate the author's theory of immunity. The majority of the articles are based on experiments undertaken for the purpose of testing the value and applicability of the author's theories.

Report of the principal veterinary surgeon for the year 1903, S. B. WOOLLATT (*Natal. Agr. Jour. and Min. Rec., 7 (1904), No. 5, pp. 467–474*).—Notes are given on rinderpest, lung sickness, glanders, sheep scab, African coast fever, plant poisoning, etc. It has thus far proved impossible to exterminate rinderpest in Zululand. This fact is accounted for by the absence of fences and difficulties of inspection. Glanders is spread to considerable extent through the agency of condemned military horses.

Dipping and strict quarantine is recommended for the control of African coast fever. The Natal government recently passed an act relating to the prevention of this disease by quarantine.

Report of the third meeting of the official veterinarians of Prussia, December 12, 1903 (*Deut. Tierärztl. Wchnschr., 12 (1904), Nos. 4, pp. 29–34; 5, pp. 42–44*).—During the sessions of this meeting the members discussed the standing of the veterinary profession, the work of the veterinary service in executing the meat inspection laws, certain desirable modifications of the German law relating to animal plagues, and the inoculation method for preventing Texas fever. A detailed account was presented of the life history of cattle ticks and of the developmental stages of the blood parasite of Texas fever.

Reports of the colonial veterinary surgeon and the assistant veterinary surgeons for the year 1903, D. HUTCHEON (*Cape Town: Govt. Printers, 1904, pp. 88, pl. 1*).—This report contains an account of the work done during 1903 by the chief veterinary officer and his staff of assistants. Investigations were made with regard to the nature, symptoms, and treatment of heartwater, malarial catarrhal fever, rinderpest, redwater, African coast fever, glanders, tuberculosis, hog cholera, etc.

Brief reports are given by the various assistant veterinarians regarding the general health of animals in their districts. A method of preventive inoculation against heartwater is being perfected. Serum inoculation was successfully used in the control of rinderpest. Redwater is said to be extending gradually southward along the east coast.

A summary is given of the discussions had at an intercolonial veterinary conference. Resolutions were adopted regarding cooperation of the government veterinary officers in South African English colonies in the control of rinderpest, African coast fever, lung sickness, glanders, epizootic lymphangitis, scab, etc.

Handbook of meat inspection, R. OSTERTAG, trans. by E. V. WILCOX (*New York: W. R. Jenkins, 1904, pp. XXXV+886, pl. 1, figs. 260*).—This is a translation from the fourth German edition of Ostertag's well-known volume on meat inspection. The subjects covered include history and present status of meat inspection, laws, butchering, art of inspection before and after slaughter, normal appearance and differentiation of the meat of different animals, abnormal physiological conditions, general pathology, organic diseases, anomalies of the blood, intoxications, animal parasites, infectious diseases, emergency slaughter, post-mortem alterations in meat, adulteration of sausages, inflation of meat, preservation and sterilization of meat. J. R. Mohler prepared the introduction, which deals chiefly with the history and present status of meat inspection in the United States.

The new meat inspection, SEIGEL (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 2, pp. 10–12*).—The author reviews certain cases in which infected or otherwise harm-

ful meat was admitted for use in the manufacture of sausages. Stricter supervision of traffic in such meat, and more severe punishment for offenders is urged by the author.

Cysticerci in Prag hams, C. DEIMLER (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 9, pp. 81, 82*).—The author recommends thorough inspection of these hams in order to avoid, so far as possible, the passing of infested ones. These hams were found to be so badly infested that 1 or 2 cysticerci could be seen in every section. *Cysticercus cellulosæ* is considered to be still of very common occurrence in Austria.

Cysticerci, ZSCHOCKE (*Deut. Tierärztl. Wchnschr., 12 (1904), No 5, pp. 41, 42*).—It is argued that the destruction or proper treatment of measly beef may be brought about to a greater extent than at present by calling more attention to the connection between such meat and *Tænia saginata* in man.

Clinical notes, J. MAREK (*Ztschr. Thiermed., 8 (1904), No. 3-4, pp. 282-288*).—Notes are given on the symptoms, etiology, and treatment of influenza, petechial fever, hemoglobinemia, and vertebral fracture in the horse, and sarcoptic scabies in hogs. Certain cases of hemoglobinemia in horses were observed to be of a paralytic nature. In such cases the patellar reflex was wanting. No evidence was obtained that the disease was of parasitic origin.

An outbreak of sarcoptic mange in hogs is reported. The disease yielded to treatment with tar liniment and creolin. The disease was also transmitted to calves merely by close association.

Clinical instructions in veterinary medicine, MALKMUS (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 6, pp. 49-53*).—Certain defects in the present system of veterinary instruction are pointed out. In order that this training may be more effective it is urged that more genuine enthusiasm be developed among students, that anatomy and physiology be taught by means of demonstrations on living animials, and that considerable knowedge of natural sciences be required before admission to advanced veterinary work.

Progress in the warfare against proprietary medicines, J. SCHMIDT (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 9, pp. 82, 83*).—The Saxon Government decreed, December 21, 1903, that prosecution be undertaken against the sale of proprietary remedies or feeds which do not show a chemical composition corresponding to the claims made for them. In case of doubt concerning the nature of these preparations appeal is to be had to some agricultural experiment station for an expert opinion.

Therapeutic investigations in veterinary science during 1901 and 1902, E. BASS (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 3, pp. 20-22*).—A brief review is given of the most important publications of 1901 and 1902 relating to mammitis, abscess, edema of the udder, and metritis.

Iodipin in veterinary medicine, MITTELDORF (*Berlin. Tierärztl. Wchnschr., 1904, No. 7, pp. 113-116*).—A critical review is presented of the literature on iodipin and related compounds. The physical and chemical characteristics of iodipin are described. This drug was used in the treatment of 16 cases of actinomycosis in cattle.

Lingual actinomycosis was completely cured, and considerable improvement was noted in cases of actinomycosis of the lymphatic glands. The iodipin was injected, usually in a 25 per cent solution, directly into the affected tissue. Good results were also obtained with the drug in the treatment of contagious coryza, angina of the pharynx, hepatic cirrhosis, and bronchial asthma.

Tallianin, C. ANGERSTEIN (*Berlin. Tierärztl. Wchnschr., 1904, No. 2, pp. 26, 27*).—Favorable results were obtained from intravenous injections of this drug in cases of laminitis, enteritis, contagious coryza, lymphangitis, parturient paresis, catarrhal bronchitis, etc. Tallianin appeared to exercise no injurious effects on horses, cattle, or dogs. In the treatment of milk fever improvement in the physical condition was

observable within 15 minutes and affected animals were able to stand within one hour.

The action of tallianin, GEORGES (*Berlin. Tierärztl. Wchnschr., 1904, No. 2, pp. 25, 26*).—This remedy is recommended for use in intravenous injections in doses of 1 to 20 cc. Excellent results were obtained with it in the treatment of 3 cases of pneumonia in horses. In severe cases the injection may be repeated at short intervals. The drug is considered harmless and as counteracting the action of the toxins of tetanus, dog distemper, etc.

Plaster of Paris bandages in veterinary practice, A. ZEHL (*Berlin. Tierärztl. Wchnschr., 1904, No. 4, pp. 57–59*).—The use of such bandages is recommended in cases of bone fractures or dislocations in horses, cattle, and other animals. In many cases the method is not as applicable as in human surgery but the results are usually satisfactory except where the conformation of the affected parts is unfavorable. Detailed clinical notes are presented on a number of cases in horses and cattle in which the author made use of plaster of Paris bandages.

Disinfecting power of coal-tar dips, L. L. LEWIS (*Oklahoma Sta. Bul. 62, pp. 16*).—The author compared the disinfectant power of zenoleum, cremoline, Lincoln dip, Carsul, chloro-naptholeum, carbolic acid, kerosene emulsion, etc. Some of the samples were fresh, others had been kept in the laboratory for periods ranging from 6 months to 2 years. No chemical analyses of the dips were made.

Several methods were tried in testing the dips, but the one finally adopted consisted in adding 5 cc. of a culture of the organism to be tested to 94 cc. of water and thoroughly mixing the whole. From this mixture cultures were made to serve as checks. After the check cultures were thus prepared 1 cc. of the disinfectant to be tested was added to the mixture of bacterial organisms and water. Cultures were then made from this mixture after the lapse of various periods.

The organisms used in these experiments were swine-plague bacillus, hog-cholera bacillus, anthrax bacillus, coli bacillus, etc. The details of the experiments are presented in a tabular form. It was found that in the laboratory a 1 per cent solution of commercial disinfectants was reasonably effective while under field conditions a 2 per cent solution was required. These proprietary dips compared favorably with carbolic acid and creolin.

These materials will be tested later to determine their action on external animal parasites. Attention is called to the necessity of making a thorough application of disinfectants in outbreaks of infectious diseases among domestic animals.

Recent developments in disinfection and sterilization, KAUSCH (*Centbl. Bakt. u. Par., 1. Abt., Ref., 34 (1904), No. 24–25, pp. 737–769, figs. 31*).—An elaborate review is presented of the details of construction in various apparatus used in disinfection and destruction of organisms pathogenic to animals and man. Some of the more interesting forms of apparatus used in the production of formaldehyde gas under pressure and other conditions are described. The author also considers disinfection by means of cresol, cobalt soap, manganese soap, and other antiseptics.

Formaldehyde apparatus, KAUSCH (*Centbl. Bakt. u. Par., 1. Abt., Ref., 34 (1904), No. 22–23, pp. 673–703, figs. 36*).—This apparatus is classified into groups according as the formaldehyde is produced from methyl alcohol, its polymeric modifications or by volatilization of solutions.

An apparatus for intravenous injection of large quantities of infectious cultures, A. CARINI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 2, pp. 318, 319, fig. 1*).—A convenient form of apparatus for this purpose is described in detail and illustrated. The apparatus can be used without danger of accident.

The infectiousness of the milk of tuberculous cows, LYDIA RABINOWITSCH (*Ztschr. Thiermed., 8 (1904), No. 3–4, pp. 203–219*).—The author discusses in a critical manner the results obtained by various investigators, including herself, in the study of tuberculous milk. While the results have varied in certain respects, they have

been remarkably uniform in indicating that tubercle bacilli may be and often are present in the milk of cows which are mere reactors and which, on post-mortem examination, show no recognizable tuberculous lesion.

Considerable space is devoted to a review of the work done by this Department. The author comes to the conclusion that tubercle bacilli are to be found in the milk of merely reacting cows quite commonly and much more frequently than has usually been assumed. Attention is therefore called to the great importance of preventing the spread of tuberculosis through the agency of the milk of tuberculous cows.

Investigations on bovine tuberculosis (*Wisconsin Sta. Rpt. 1903, pp. 250–255, fig. 1*).—A brief review of the results obtained in the following investigations previously published by the Wisconsin Station:

Tuberculosis and the Tuberculin Test (E. S. R., 6, p. 333); Efficiency of Tuberculin as a Diagnostic Agent in Tuberculosis (E. S. R., 8, p. 332); Infectiousness of Milk from Tuberculous Cows (E. S. R., 8, p. 334); Relation of Separator Slime to Tuberculosis in Hogs (E. S. R., 8, p. 334); Tuberculin Inoculations for 1896 (E. S. R., 9, p. 594); Restricting Tuberculosis by Isolation (E. S. R., 9, p. 591); History of a Tuberculous Herd of Cows, by H. L. Russell (E. S. R., 11, p. 986); Effect of Different Influences on Normal Temperatures of Cattle (E. S. R., 12, p. 92), by H. L. Russell and V. H. Bassett; Examination of Milk for Tubercle Bacilli (E. S. R., 12, p. 90), by V. H. Bassett; Bovine Tuberculosis in Wisconsin (E. S. R., 13, p. 284), by H. L. Russell and E. G. Hastings; Thermal Death Point of Tubercle Bacilli under Commercial Conditions (E. S. R., 13, p. 83).

The tuberculin reaction, FEISTMANTEL (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 2, pp. 282–290*).—Some investigators have argued that the tuberculin reaction can not be considered as specific since tuberculous animals react to other substances than tuberculin and also since tuberculin may cause a reaction in diseases other than tuberculosis. Tuberculins from various sources were compared with the toxins of other closely related species of bacteria.

In order to declare positively for a reaction in any case the author required the fulfillment of the following conditions: Elevation of temperature, 1.2°; typical tuberculin curve; and the production of a temperature above any observed before injection or during the first day after injection. The final results will be published in a forthcoming article by the author.

Antifebrin used in masking the effects of tuberculin, A. GRÉGOIRE and J. HENDRICK (*Bul. Agr. [Brussels], 20 (1904), No. 3, pp. 445, 446*).—The authors describe in considerable detail a technical method for detecting this fraud by an examination of the urine. The drug may be demonstrated by means of the usual tests for acetanilid. It was found that paramidophenol could be detected in a solution of 1:10,000,000. The same test proved serviceable in demonstrating salicylic acid, which is also used occasionally in masking a tuberculin reaction.

Tuberculosis in hogs, L. L. LEWIS (*Oklahoma Sta. Bul. 63, pp. 8*).—The milk of tuberculous cows was fed to pigs in considerable quantities for a period of 2 months. The experiment showed that such milk contained tubercle bacilli and was pathogenic for hogs, some of which died of generalized tuberculosis.

The physical symptoms even in serious cases of tuberculosis in hogs were not very marked. The infected hogs were tested with tuberculin for the purpose of learning the value of this reagent in diagnosing tuberculosis in hogs. It was found that in hogs which were not used to being handled, the mere taking of the temperature caused an elevation of 1 to 2 degrees. In general, however, the results obtained from the tuberculin test were thoroughly reliable.

Anthrax in Wisconsin (*Wisconsin Sta. Rpt. 1903, pp. 256–258*).—This is a summary of the following articles: Outbreak of Anthrax Traceable to Tannery Refuse, by H. L. Russell, and Experiments on Treatment of Anthrax Hides with Formaldehyde Solutions, by E. G. Hastings (E. S. R., 13, p. 91).

Artificial immunity of rabbits toward anthrax, O. BAIL (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 2, pp. 266–272*).—The experiment carried out by the author indicates that in rabbits the leucocytes play a more important rôle than the serum in the production of immunity. There appeared to be no constant relation between the precipitating and protecting power of rabbit blood with regard to anthrax. The author describes his bacteriological methods and gives notes on further experiments in which the serum of chickens and sheep was used in artificially immunizing rabbits to anthrax.

The occurrence of anthrax in the horse, FRANCKE (*Fortschr. Vet. Hyg., 2 (1904), No. 3, pp. 81, 82*).—Notes on anthrax as observed in the horse. Details are given on the symptoms and pathological anatomy of equine anthrax contracted from an affected cow. Infection apparently took place through a skin wound in the neck region. No alterations could be observed in the intestines.

Generalized actinomycosis, A. ASSMANN (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 7, pp. 63, 64*).—Contrary to the generally accepted opinion, the author maintains on the basis of extensive statistics that generalized actinomycosis is of comparatively frequent occurrence. Detailed notes are given on the clinical history and post-mortem appearance of 11 such cases in cattle and hogs. From these notes it appears that a great variety of parts and organs may be simultaneously affected by actinomycotic lesions.

Milk fever in cows which have not calved and the etiology of milk fever, G. MEIER (*Berlin. Tierärztl. Wchnschr., 1904, No. 6, pp. 89–92*).—An elaborate account is presented of the nature of milk fever with critical references to the literature of the subject.

Detailed clinical notes are given on 5 cases of the disease in cows which had calved from 4 to 8 months previously. The author states that many other such cases have come under his observation. In such cases there is apparently no connection between calving and the disease. The author believes that previously announced hypotheses concerning the nature of milk fever must be abandoned. The idea that the disease is an intoxication is combated and discarded.

In the author's opinion the chief cause of milk fever is excessive rations of concentrated feeding stuffs. In localities in which the disease has increased most rapidly, heavy feeding with grains (up to 18 lbs. per day) has been indulged in for the purpose of increasing the milk flow. This excessive feeding may cause an unusual flow of blood to the udder. The author defines milk fever as a cerebral anemia caused by hyperemia of the udder and digestive apparatus.

The beneficial results obtained by pumping air, water, or other fluids into the udder are explained as due to the fact that thereby the excess quantity of blood is forced out of the udder. The name cerebral anemia is suggested to replace milk fever.

Infusion of air into the udder in cases of milk fever, E. WISSMANN (*Berlin. Tierärztl. Wchnschr., 1904, No. 9, pp. 153, 154*).—The author adopted this method in the treatment of 15 cases of milk fever, with complete recovery in 14 cases. Recovery took place in periods ranging from 20 minutes to 20 hours. The most important and most interesting points in the clinical history of these cases are presented in a tabular form. The author believes that mammitis need never develop as a result of this operation if ordinary care is exercised in cleaning the instruments and filtering the air.

Lead poisoning in cows, DÖHRMANN (*Berlin. Tierärztl. Wchnschr., 1904, No. 5, pp. 69, 70*).—In most cases of lead poisoning in cows observed by the author constipation was present, but less often a pronounced diarrhea was observed. In treating the trouble good results were sometimes obtained by administering Glauber salts. Sulphuric acid, however, was most effective. Badly poisoned animals gradually

become much emaciated. It is better, therefore, to slaughter them at once than to undertake the tedious and uncertain process of treatment.

An outbreak of acute lead poisoning in cows, DAMMANN (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 1, pp. 2, 3*).—In a herd of 30 cows 19 became poisoned with lead which was deposited on the surface of sugar beets, together with silt carried by a flood. As treatment each cow received Glauber salts in 250 gm. doses 3 times daily. Recovery took place in 15 of the 19 affected cows after a period of 1 to 3 days.

Manual separation of the retained after-birth in cows, P. GRUNTH (*Ztschr. Thiermed., 8 (1904), No. 3-4, pp. 220-232*).—The literature of the subject is discussed in connection with numerous bibliographical references. Notes are given on the results obtained from rendering manual assistance in the removal of the after-birth within 24 hours after calving. The author believes that this is a desirable practice in all cases.

Prevention of white scour in calves (*Bd. Agr. and Fisheries* [*London*], *Leaflet 101, pp. 2*).—In preventing this disease thorough disinfection of the premises is recommended, together with antiseptic treatment of the navel immediately after birth.

Milk treated with formalin, a new remedy for calf dysentery, M. KLIMMER (*Ztschr. Thiermed., 8 (1904), No. 3-4, pp. 289-291*).—Some evidence has been obtained in favor of the belief that cows which have been immunized against tuberculosis by the method of von Behring yield milk containing immune bodies and tending to increase the resisting power of calves and children toward tuberculosis.

Proceeding on this basis it seemed desirable to find a method of milk sterilization which would not destroy the immune bodies in the milk. Pasteurization has such effect. Resort was therefore had to the use of formalin. It was found that milk could be sterilized and preserved for long periods by adding formalin at the rate of 1:4,000. Milk containing that proportion of formalin had no bad effect on calves or children and was found to be very efficient in preventing and curing calf dysentery.

Preventive treatment for infectious dysentery of calves, A. TROST (*Ztschr. Thiermed., 8 (1904), No. 3-4, pp. 291-293*).—An outbreak of this disease is described in which finally all the calves on the estate died. Endovenous injections of 0.05 per cent collargol were tried on 14 calves. All calves which were treated within a few hours after birth remained healthy. A few of those which were not immediately injected developed the disease, but only 3 died.

Can the "Piroplasma bigeminum" find a habitat in the human subject? A. LINGARD (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 2, pp. 214-216, pl. 1*).—Brief notes are given on the variations in form of the blood parasite of Texas fever under different conditions. The author discusses in some detail a case of a cattle attendant who developed a disease closely resembling Texas fever while associated with cattle affected with this disease. Blood parasites were found which could not be distinguished from those of Texas fever.

Preliminary report on the study of rinderpest of cattle and carabaos in the Philippine Islands, J. W. JOBLING (*Philippine Dept. Int., Bureau Govt. Lab.* [*Pub.*], *1903, No. 4, pp. 22, pl. 1*).—A general discussion of the symptoms, prevention, and treatment of rinderpest. In preventing the disease the best results are obtained by the serum method. The advantages of this method consist in the facts that no reaction is produced; no suppression of milk flow occurs; immunity is almost immediately developed, and no abortion occurs. The amount of serum required is 15 to 20 cc. according to the susceptibility of the animal.

It is argued that by applying preventive inoculation to all animals now in the Philippines and to all animals imported hereafter the disease can be eradicated in the islands. No treatment is satisfactory.

A report on hemorrhagic septicemia in animals in the Philippine Islands, P. G. WOOLLEY and J. W. JOBLING (*Philippine Dept. Int., Bureau Govt. Lab.* [*Pub.*],

1903, No. 9, pp. 21).—This disease first appeared in the Philippines in cattle imported from Shanghai in 1903.

Notes are given on the history of this outbreak and on the distribution of the disease throughout the world. The clinical symptoms and lesions in 13 cases in carabaos are described in detail. Acute and chronic cases were noted. Classified according to pathological lesions the disease presents two types, the pulmonary and the septicemic. The same organism was isolated from both types of cases. In laboratory experiments, this organism proved pathogenic for guinea pigs, rabbits, monkeys, dogs, and chickens. Thus far the authors have been unable to obtain any serum of value in treating or preventing the disease.

Some pulmonary lesions produced by the bacillus of hemorrhagic septicemia of carabaos, P. G. WOOLLEY (*Philippine Dept. Int., Bureau Govt. Lab.* [*Pub.*], *1903, No. 12, pp. 11*).—The different kinds of pathological lesions produced by this disease are described in detail. In one carabao the lesions were almost identical with those of pleuro-pneumonia. Smear cultures from the cardiac blood killed guinea pigs within 20 hours.

In another case there were small pericardial hemorrhages about the base of the heart. The organism isolated from this case was pathogenic for monkeys, small birds, guinea pigs, and rabbits. In a third case in a horse the lungs showed congestion, the air cells were distended, and the fibrous tissue was increased in amount. The author is unable to explain how the organism of hemorrhagic septicemia gained access to the lungs in these 3 cases.

Bronchitis due to barley chaff, BEHRENS (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 7, pp. 62, 63*).—An outbreak of bronchitis in sheep led to the institution of experiments to determine whether dry cotton-seed meal could cause the disease. Negative results were obtained from these experiments with sheep. Further observations, however, showed conclusively that the inhalation of barley chaff may cause fatal bronchitis in cattle.

In one case due to this cause the lungs were found to be hepatized, especially in the anterior portions. An examination of microscopic preparations from the lungs and bronchi disclosed the fact that the tissue had been punctured and irritated by fragments of barley chaff.

Sheep scab in Tasmania (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 730–732*).—A brief statement of how the disease was exterminated in Tasmania within a period of 8 years. The dip used was made of lime and sulphur.

Necrosing mastitis, ZOBEL (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 11, pp. 101, 102, fig. 1*).—The symptoms and pathological anatomy of this disease are described with especial reference to a case in a goat. This case was of 13 weeks' standing and a large abscess had formed and broken. The case was diagnosed as parenchymatous mastitis.

Horse sickness and its prevention, R. KOCH (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 663–675*).—The author found that in order to secure uniform results in the production of artificial immunity to horse sickness it is necessary to give careful attention to the preparation of the virus and serum. Both of these products can be preserved for a long period.

For the sake of economy it is desirable that the virus be just strong enough to cause an attack of the disease, and that the serum be capable of holding the disease within safe limits. When this method is further perfected the author hopes that the process of immunizing susceptible horses will not require more than 4 to 6 weeks. Detailed directions are given for the preparation of both virus and serum.

Horse sickness, R. KOCH (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 5, pp. 479–481*).—Immune horses were secured and inoculated with virulent blood in order to intensify the immunity. A maximum dose of 2,000 cc. was injected without bad

effects. After this process had been continued for several months the serum of treated animals was found to have considerable protective power.

Experiments on 5 horses demonstrated that serum from treated animals is capable of protecting susceptible animals from lethal doses of virulent blood. The serum has no striking curative properties. It is not hemolytic, and causes no hemoglobinuria. By means of combinations of virus and serum it was found possible to produce a mild form of horse sickness, which in turn conferred a lasting immunity from the disease. The author believes that a practical method of immunization has been found.

A preliminary report on trypanosomiasis of horses in the Philippine Islands, W. E. Musgrave and N. E. Williamson (*Philippine Dept. Int., Bureau Govt. Lab.* [*Pub.*], *1903, No. 3, pp. 26, pls. 2*).—The authors discuss the history of the epidemic in the Philippines, the mode of transmission, symptoms, diagnosis, and preventive measures. The position is taken that infection occurs through skin wounds produced by biting flies, fleas, lice, mosquitoes, etc. Apparently, infection can not take place through the healthy intestines. The authors' experiments confirm this belief.

The symptoms and lesions are described in considerable detail. In the Philippines the disease is invariably fatal to horses. Thus far the authors have not observed the disease in cattle or carabaos. In preventing the spread of this disease proper quarantine and sanitary measures should be adopted. It is urged that all animals affected with the disease be immediately destroyed and that the carcasses be burned or that flies and other biting insects be prevented from gaining access to the body.

Poisoning from harmful and adulterated feed stuffs, Hoehne (*Berlin. Tierärztl. Wchnschr., 1904, No. 4, pp. 59–61*).—Several hogs were fatally poisoned by eating rye meal. Post-mortem examination showed an inflammatory condition of the intestinal mucous membrane. Petechiæ were observed on the auricles of the heart. The cause of poisoning was not definitely determined. Similar cases were observed in other animals.

Certain cases were evidently due to adulteration of the milling products used as feed. Samples of rye studied by the author contained 8.25 per cent of corn-cockle seed. It was found that corn cockle exercised a poisonous action on hogs. The seed of the hairy vetch was also shown to be poisonous to hogs although the green forage was very palatable and quite harmless. The author recommends a stricter inspection of feeding stuffs and severe punishment for the sale of adulterated feed. It is believed that in certain localities the loss of swine from poisonous feeds is as great as from infectious diseases.

Results from fighting swine erysipelas in the Grand Duchy of Hessen, 1901–1903, Lorenz (*Ztschr. Thiermed., 8* (*1904*), *No. 3–4, pp. 261–281, dgm. 1*).—The results of preventive vaccination under government auspices in the control of this disease have proved to be very encouraging. Vaccinated animals have been protected against infection and swine erysipelas has not been spread by the extensive adoption of vaccination, as claimed by certain authors. The expense of vaccination is not great and is justified by the results. The extensive data upon which the author's discussion is based are presented in tabular form.

Swine plague and fowl cholera, Georges (*Berlin. Tierärztl. Wchnschr., 1904, No. 1, pp. 5, 6*).—Attention is called to the close relationship between these two diseases. A serious outbreak of swine plague occurred on an estate where the disease was previously unknown but where fowl cholera had prevailed extensively. The affected hogs had been allowed to run in the chicken yard.

A second outbreak of swine plague occurred under similar circumstances and with much more convincing evidence of the relationship between this disease and fowl cholera. Feed which had been contaminated by the diseased hogs was fed to geese

with the result that all the geese died of fowl cholera. It is recommended that hogs and domestic fowls be kept in separate yards.

Swine plague and fowl cholera, KLEINPAUL (*Berlin. Tierärztl. Wchnschr., 1904, No. 9, p. 150*).—In opposition to Georges, the author takes the position that the simultaneous occurrence of these diseases on the same estate furnishes no evidence of their relationship or identity. Attention is called to the fact that both swine plague and fowl cholera are of almost universal distribution and must sometimes occur simultaneously in one locality.

Fowl cholera, A. R. WARD (*California Sta. Bul. 156, pp. 20*).—Fowl cholera occurred in a serious outbreak in California in 1903, and this outbreak gave an opportunity to the author to study the disease. It appeared to be very rapidly fatal, a large percentage of infected fowls dying within 3 days after exposure. It was found to be an easy matter to infect healthy fowls by feeding them on the entrails and flesh of birds dead of the disease. Infection may also be spread to some extent by means of the fluid which drips from the beaks of infected fowls.

Experiments were carried on in disinfecting poultry houses by means of crude carbolic acid and crude sulphuric acid mixed in equal proportions at the rate of ½ gal. of each to 20 gal. of water. This mixture was effective, but was objectionable on account of ruining clothing and rubber hose and producing sores on the skin of the workmen. Crude carbolic acid used alone was objectionable on account of the difficulty in keeping it mixed with water. Crude carbolic acid and phenolene used in equal parts, mixed at the rate of ½ gal. each to 20 gal. of water, proved very satisfactory.

In order to supplement the general process of disinfection by further preventive measures, the author tested the effect of adding corrosive sublimate to the drinking water at the rate of 1 part to 2,000. No injurious effects were produced upon the birds. The result of these two disinfectant measures was rapidly to reduce the death rate and ultimately to eradicate the disease. In controlling fowl cholera the author recommends, as one of the most important remedies, the burning or burying of dead fowls, or preferably their destruction, as soon as the slightest symptoms are shown.

The symptoms of fowl cholera are punctiform hemorrhages upon the heart and similar whitish spots on the liver. The first-named lesion is present in all cases, and the second in more than half of the cases. The excreta are yellowish, and the birds refuse to eat but appear to be thirsty. A marked drowsiness is observed together with a rising of temperature. Turkeys seem to be affected in the same manner as common fowls. The behavior of the fowl-cholera bacillus upon various nutrient media is described, and notes are given on its reaction to heat and disinfectants. The organism appears to be pathogenic for various fowls and pigeons, as well as for guinea pigs.

Phosphorus poisoning in fowls, SCHMUTZER (*Berlin. Tierärztl. Wchnschr., 1904, No. 5, pp. 70, 71*).—Phosphorus poisoned fowls showed pronounced opisthotonus just before death. The odor of phosphorus was present in the stomach contents. The phenomenon of phosphorescence was observed when the stomach contents were rubbed between the fingers in a dark room. Ecchymoses on the surface of the heart constitute an almost constant pathological alteration in cases of phosphorus poisoning.

A new fatal eye disease of pheasants (*Berlin. Tierärztl. Wchnschr., 1904, No 2, pp. 28, 29*).—During the progress of the disease described in this paper the cornea of affected pheasants became cloudy. Later a purulent process developed, resulting in an abscess of considerable size and involving the supraorbital space. Death took place in all cases after about 10 days. The application of antiseptic washes seemed to hasten the fatal outcome rather than check the disease.

An interesting tapeworm of pigeons, K. WOLFFHÜGEL (*Berlin. Tierärztl. Wchnschr., 1904, No. 3, pp. 45–48, figs. 4*).—Detailed notes are given on the anatomi-

cal peculiarities of *Bertia delafondi* as found in the small intestines of the common pigeon. The literature of the subject is briefly reviewed.

A bacillus found in eggs, L. PALMANS (*Bul. Agr. [Brussels], 20 (1904), No. 3, pp. 447–452*).—A bacillus was isolated from hens' eggs and was found to be pathogenic for guinea pigs but not for pigeons, rabbits, or chickens when inoculated in small doses. Morphologically the organism could hardly be distinguished from the anthrax bacillus, which it also closely resembled in its behavior on various culture media. The author suggests that this organism may be a parent form of *Bacillus anthracis* and *B. subtilis*.

The formation of toxins by rabies virus, O. HELLER and E. BERTARELLI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 2, pp. 216–222*).—The literature of this subject is critically discussed in connection with a short bibliography. The purpose of the authors' experiments was to determine whether rabies toxins are combined with certain bodies or are free in the fluids of the tissues. The brain and spinal cord of rabid rabbits were tested with this object in view.

It was found that the brain substance of rabid animals is toxic, while that of normal animals is toxic to a smaller extent. The symptoms produced by rabies toxin are not uniform or constant. Experimental animals gradually acquired a certain resisting power toward repeated injections of brain substance. No immunity is produced, however, by inoculation of noninfectious material.

Chorea in dogs, E. JOEST (*Ztschr. Thiermed., 8 (1904), No. 3–4, pp. 179–201*).—The literature of this subject is critically reviewed, together with detailed notes on a case observed by the author. The symptoms in all cases appear to be quite similar, the most characteristic symptom being irregular muscle contractions. The disease runs a slow course, with ultimate recovery in most cases. Chorea is almost without exception a sequela of distemper. Human and canine chorea have much in common. Both occur after infectious diseases and are accompanied by almost identical lesions in the central nervous system.

Salipyrin poisoning in dogs infested with Ascaridæ, HAASE (*Berlin. Tierärztl. Wchnschr., 1904, No. 5, p. 70*).—The administration of salipyrin in small doses to dogs was found to produce epileptiform spasms and acute gastritis, followed by death. The dogs were infested with *Ascaris mystax*, which had already brought about a serious intestinal catarrh.

The extirpation of wild carnivora, J. M. ORPEN (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 689–694*).—Attention is called to the danger from the spread of rabies in southern Africa. In order to prevent this the author recommends the destruction of all carnivorous animals which may carry the disease. Various methods of trapping, poisoning, or otherwise killing carnivora, including rats, are described.

AGRICULTURAL ENGINEERING.

Irrigation in humid climates (*Wisconsin Sta. Rpt. 1903, pp. 318–332*).—A summary of investigations during the 10 years ending with 1903. The following articles are included:

Amount of water necessary for the production of a pound of dry matter, by F. H. King (pp. 318–322).—The Amount of Water Required to Produce a Pound of Dry Matter in Barley, Oats, Corn, Clover, and Peas in Wisconsin (E. S. R., 5, p. 484); The Amount of Water Required to Produce a Pound of Dry Matter in Wisconsin (E. S. R., 7, p. 567); The Number of Inches of Water Required for a Ton of Dry Matter in Wisconsin (E. S. R., 8, p. 293); The Importance of Right Amount and the Right Distribution of Water on Crop Production (E. S. R., 10, p. 746).

Amount of water needed for maximum crops under field conditions (pp. 323–332).—The Influence of the Water Pumped on the Yield of Crops Grown on the Area, by F. H. King (E. S. R., 8, p. 295); Experiments in Irrigation, by F. H. King (E. S. R.,

8, p. 733; 9, p. 594); The Importance of the Right Amount and Right Distribution of Water on Crop Production, by F. H. King (E. S. R., 10, p. 746; 11, p. 537); The Influence of the Right Amount and Right Distribution of Water on Crop Production, by F. H. King (E. S. R., 12, p. 40; 13, pp. 34, 936); Relation of Crop Production to Amount of Water Available and Method of Cultivation, by A. R. Whitson (E. S. R., 14, p. 955).

The right way to irrigate, J. A. Widtsoe and W. W. McLaughlin (*Utah Sta. Bul. 86, pp. 53–101, pls. 8, figs. 23*).—This is a popular exposition of some of the results reported in Bulletin 80 of the Utah Station (E. S. R., 15, p. 655).

An irrigation system in the region of Hyères, J. Farcy (*Jour. Agr. Prat., n. ser., 7 (1904), No. 9, pp. 619–622, figs. 2*).—A system for irrigating about 75 acres from wells is described.

The railroads and the wagon roads (*U. S. Dept. Agr., Office of Public Road Inquiries Circ. 37, pp. 4*).—This paper was read by A. L. Craig, general passenger agent of the Oregon Railroad and Navigation Co., before the Oregon State Good Roads Association at its first annual convention, held in Portland, October 24, 1903.

List of National, State, and local road associations and kindred organizations in the United States (*U. S. Dept. Agr., Office of Public Road Inquiries Circ. 36, rev., pp. 14*).

Problems in farm mechanics, F. H. King (*Wisconsin Sta. Rpt. 1903, pp. 346–353*).—A summary of investigations during the 10 years ending with 1903. The following articles are included:

Silos (pp. 346–349).—The Construction of Silos (E. S. R., 3, p. 248), The Construction of Silos and the Making and Handling of Silage (E. S. R., 9, p. 393), Silage and the Construction of Modern Silos (E. S. R., 12, p. 495).

Country roads (pp. 349–352).—Principles of Construction and Maintenance of Country Roads (E. S. R., 11, p. 1095).

Feed grinding (pp. 352, 353).—Experiments in Grinding with Small Steel Feed Mills (E. S. R., 12, p. 492).

The history, construction, and critical examination of mowing machines, A. Nachtweh (*Landw. Jahrb., 32 (1903), No. 5–6, pp. 655–772, pls. 6, figs. 111*).—The history of the development of the mowing machine is reviewed, the general construction of such machines is discussed, and results of detailed examinations of a large number of makes are reported.

Electricity in agriculture, E. Guarini (*L'électricité agricole. Lausanne: Société Suisse d'Édition; Paris: Fischbacher [1904], pp. 162, ill.; rev. in Jour. Agr. Prat., n. ser., 7 (1904), No. 16, p. 525*).

MISCELLANEOUS.

Twenty-Seventh Annual Report of Connecticut State Station, 1903 (*Connecticut State Sta. Rpt. 1903, pp. XIV*).—These pages accompanying part 5 of the report of the station for the year ended October 31, 1903, contain an announcement concerning the work of the station; a brief report of the board of control on the work of the station during the year, and a financial statement for the year ended September 30, 1903.

Thirty-Seventh Annual Report of the Connecticut State Board of Agriculture, 1903 (*Connecticut State Bd. Agr. Rpt. 1903, pp. 325*).—Among the addresses delivered at the meeting of the board held in December, 1903, and published in this report, are the following: Agricultural Fairs Improvement, by H. B. Cowan; Dairying in France, by H. E. Alvord; Evolution of Farm Machinery and its Effect upon the Life and Business of the Farmer, by J. M. Hubbard; Farmers' Institutes, by J. Hamilton; Intensive Cultivation, by G. M. Clark; Potato Growing in Connecticut, by A. L. Clinton; Reminiscences of Thirty Years of Agricultural Science in Connecticut, by W. O. Atwater; The Corn Crop in Connecticut, by E. H. Jenkins;

The Commercial Side of Fruit Growing, by J. H. Hale; The Cow Feeder's Great Problem, by F. S. Cooley; The Decline in the Value of New England Land—How to Arrest and Improve it, by G. T. Powell; and The Education of the American Farmer, by K. L. Butterfield.

Annual Report of Idaho Station, 1903 (*Idaho Sta. Rpt. 1903, pp. 34*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; and reports of the director and heads of departments on the different lines of station work during the year. The report of the meteorologist is noted elsewhere.

Sixteenth Annual Report of Louisiana Stations, 1903 (*Louisiana Stas. Rpt. 1903, pp. 24*).—This contains reports of the work of the Sugar Station at Audubon Park, the State Station at Baton Rouge, and the North Louisiana Station at Calhoun; notes of the geological and soils surveys being made in the State; the organization lists of the stations, and a financial statement for the fiscal year ended June 30, 1903.

Nineteenth Annual Report of Maine Station, 1903 (*Maine Sta. Rpt. 1903, pp. 219*).—This is made up of Bulletins 89–99 of the station on the following subjects: Experiments in orchard culture (E. S. R., 15, p. 39), fertilizer inspection (E. S. R., 15, p. 26), the chinch bug in Maine (E. S. R., 15, p. 56), feeding stuff inspection (E. S. R., 15, p. 287), poultry experiments in 1902 (E. S. R., 15, p. 394), fertilizer inspection (E. S. R., 15, p. 348), nitrate of soda and muriate of potash as top-dressing for grass land (E. S. R., 15, p. 355), dandelions (E. S. R., 15, p. 360), hawkweeds (E. S. R., 15, p. 372), ginseng (E. S. R., 15, p. 360), cankerworms (E. S. R., 15, p. 381), plant-house aleurodes (E. S. R., 15, p. 882), wheats and flours of Aroostook County (E. S. R., 15, p. 867), potato experiments in 1903 (E. S. R., 15, p. 972), notes on the Angora goat (E. S. R., 15, p. 996), the preservation of hen manure (E. S. R., 15, p. 958), and finances, meteorology, and index (E. S. R., 15, pp., 956, 1025).

Fifteenth Annual Report of New Hampshire Station, 1903 (*New Hampshire Sta. Bul. 104, pp. 83–98*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1903, and brief reports of the vice-director and heads of departments. The report of the chemist contains analyses of a number of samples of cattle and poultry foods.

Sixteenth Annual Report of Rhode Island Station, 1903 (*Rhode Island Sta. Rpt. 1903, pp. 173–300 + VII*).—This contains the organization list of the station; a report of the director reviewing the different lines of station work during the year and calling attention to the needs of the station; departmental reports noted elsewhere; a financial statement for the fiscal year ended June 30, 1903, and lists of donations and exchanges.

Twentieth Annual Report of Wisconsin Station, 1903 (*Wisconsin Sta. Rpt. 1903, pp. 414*).—This contains the organization list of the station; a report of the director; a description of the new agricultural building and a history of the agricultural college and experiment station of the University of Wisconsin, by W. A. Henry; numerous articles summarizing the work of the experiment station during the last 10 years; lists of exchanges and acknowledgments, and a financial statement for the fiscal year ended June 30, 1903.

The Royal Agricultural Academy of Bonn [Poppelsdorf], P. Rolley (*Ann. Inst. Nat. Agron., 2. ser., 3 (1904), No. 1, pp. 75–128, figs. 8*).—This is an account of the history, equipment, and organization of this institution, with a detailed outline of the courses of instruction and statistics as regards attendance.

[Reports of the agricultural experiment stations in Austria] (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 4, pp. 265–364*).—This includes reports of the following experiment stations: Agricultural Experiment Station for Plant Culture, Brünn; Experiment Station of the Lower Austrian Agricultural, Horticultural, and Viticultural Schools, Feldsberg; Agricultural Chemical Experiment and Seed Control Station, Gratz; Agricultural Chemical Experiment Station of the Royal Imperial

Agricultural Society of Carnithia, Klagenfurt; Agricultural Chemical Experiment Station for Carniola, Laibach; Chemical Experiment Station, Lobositz; Agricultural Institute and Experiment Station, St. Michael-on-the-Etsch; Agricultural Physiological Experiment Station of the Bohemian Section of the Agricultural Council for the Kingdom of Bohemia, Prague; Experiment Station for the Sugar Industry, Prague; Agricultural Botanical Experiment Station of the Royal Bohemian Agricultural Academy at Tabor; Station for Plant Diseases and Plant Protection of the Royal Agricultural Academy of Tabor; Agricultural Chemical Experiment Station of the State Agricultural Academy, Tetschen-Liebwerd, and the Agricultural Botanical Experiment and Seed Control Station, Troppau.

Rise and decline of extensive agriculture in England, H. LEVY (*Entstehung und Rückgang des Landwirtschaftlichen Grossbetriebes in England. Berlin: Julius Springer, 1904, pp. VI-247*).—The origin and development of extensive agriculture in England from 1750 to 1880 are considered, and agricultural conditions as existing at present are discussed. The following subjects are given especial attention: Changes in conditions affecting agricultural production and markets; size of farms; economic causes of a new development in farm management; social and political factors in their relation to agriculture at the present time; economic advantages and disadvantages of farms of certain sizes; and agricultural societies.

Agriculture and animal husbandry in Norway, 1896-1900, A. N. KIÄR (*Norges Offic. Statistik, 4. ser., 1903, No. 72, pp. LIV+252*).—Statistical data are reported. The total area of arable land in Norway is given as 213,847 hectares, or 0.66 per cent of the total land surface. The farms numbered 159,255, the average size of each being 1.34 hectares (3.3 acres). Potatoes, oats, barley, and rye were the leading crops. The number of horses was 172,999, cattle 950,201, sheep 998,819, goats 214,594, swine 165,348, reindeer 108,784.

The average yield of milk per cow was 1,279, or for the more progressive farmers, 1,729 liters, the average price for new milk 10.78 öre (2.89 cts.) per liter, and for butter 1.64 kroner (44 cts.) per kilogram. The total number of creameries was 783, of which number 765 received a total of very nearly 170,000,000 kg. of milk. The number of cheese factories was 62, sixty of which used 14,000,000 kg. of milk.—F. W. WOLL.

Report of committee on indexing agricultural literature, A. C. TRUE ET AL. (*U. S. Dept. Agr., Office of Experiment Stations Circ. 54, pp. 2*).—This report has already been noted (E. S. R., 15, p. 324).

The relation of the natural sciences to agriculture in a four-year college course, A. C. TRUE ET AL. (*U. S. Dept. Agr., Office of Experiment Stations Circ. 55, pp. 15*).—This is a report of the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, and has already been noted (E. S. R., 15, p. 325).

Constitution of the Association of American Agricultural Colleges and Experiment Stations, as amended at the seventeenth annual convention of the association, Washington, D. C., November 17-19, 1903 (*U. S. Dept. Agr., Office of Experiment Stations Circ. 56, pp. 4*).

Agricultural exports of the United States, 1851-1902, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 34, pp. 100, dgm. 1*).—A statistical report showing the quantity, value, and average price of the various agricultural products exported by the United States during each fiscal year from 1851 to 1902, inclusive.

Foreign import tariffs on grain and grain products, 1903, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 37, pp. 59*).

NOTES.

Alabama College.—G. H. C. Williams, a graduate of the Pennsylvania State College, has been appointed instructor in agriculture.

Alaska Station.—Fred E. Rader, who has been an assistant at the Sitka Station since the spring of 1900, assumed charge of the station at Rampart July 1. For want of means this station has never been equipped, although Isaac Jones was stationed there from August, 1900, to September, 1901. He cleared a patch of ground and successfully raised winter rye, barley, oats, and hardy vegetables. When he resigned in 1901 the funds did not admit of putting another man in his place, but now that the most necessary pioneer work has been done at the other stations, the Rampart Station will be equipped with implements. Land will be cleared, a house built, and a determined effort will be made to show what the agricultural capabilities are in that region. The station is located in latitude 65° 30′, and is probably the most northern agricultural experiment station in the world.

Arizona Station.—V. A. Clark, recently assistant in horticulture at the New York State Station, has been elected horticulturist to the Arizona Station, and will be located on the station farm at Phoenix.

Arkansas University and Station.—G. A. Cole, instructor in mathematics and bookkeeping in the college, has been elected to succeed C. L. Newman, agriculturist in the college and station, who has severed his connection with that institution.

California University and Station.—C. W. Woodworth has been promoted from assistant professor to associate professor of entomology. C. M. Haring has been appointed instructor in veterinary science and bacteriology. F. T. Bioletti, formerly of this station, and now of the Elsenburg School of Agriculture, Cape Colony, has been appointed assistant professor and viticulturist, vice E. H. Twight, resigned.

Colorado College.—According to press reports, the college has purchased what is known as the "Model Colorado Farm," adjacent to the college grounds, to be used for extending the work of the college and station. The farm comprises 80 acres of land, and the price paid is reported as $26,000.

Connecticut College and State Station.—Owing to the large number of applicants for admission to the Connecticut Agricultural College, a press bulletin has been issued by this institution announcing the discontinuance of the customary August entrance examinations at Hartford, New Haven, Danbury, and Norwich. Already more students than can be accommodated in the dormitories of the institution have qualified for entrance on the opening of the fall term, September 21. Alfred Akerman succeeded Walter Mulford as station forester on July 1.

Florida University and Station.—At a meeting of the board of trustees the latter part of June, the resignations of T. H. Taliaferro, president and director, H. A. Gossard, entomologist, H. K. Miller, chemist, and R. A. Lichtenthaeler, assistant chemist, were called for and accepted.

Hawaiian Sugar Planters' Station.—A division of entomology has recently been added to the experiment station and will occupy quarters adjoining the agricultural division. New offices, insectaries, and a large cane propagation house are being

erected. The staff of the new division includes the following: R. C. L. Perkins, superintendent; A. Koebele, consulting entomologist; G. W. Kirkaldy, F. W. Terry, and Otto Swezy, assistant entomologists.

Illinois University.—By request, the university is preparing an exhibit of the market classes of cattle, to be shown at the St. Louis Exposition, September 12–24, in connection with the exhibits of the colleges and experiment stations. It is not generally known that a complete exhibit of this kind requires some forty-eight animals, even when but one specimen of each recognized grade is shown. The stall of each animal will be fully labeled, giving class and grade to which the animal belongs and for what purpose that particular kind is used. This will without doubt be one of the most attractive exhibits at the exposition.

Iowa College and Station.—W. H. Olin, assistant in field crops, has resigned to accept the head of the department of agronomy at the Colorado College and Station. L. S. Klinck, a graduate of the Ontario Agricultural College, has been elected to succeed him. O. W. Wilcox has been elected to the position of assistant in soils. Dr. Wilcox is a graduate of the University of Texas and has taken a Ph. D. degree at the University of Chicago. J. W. Jones has been elected assistant in farm crops to succeed T. S. Hunt. J. B. Weems has resigned his position as station chemist. A successor has not yet been elected. Hugh G. Baker, who is at present connected with the Bureau of Forestry, has been elected assistant in the department of horticulture. Mr. Baker is a graduate of the Michigan Agricultural College and has recently completed the course in forestry at Yale. He will devote one-half of his time to forestry work of the college and one-half to work of the Bureau of Forestry. E. S. Gardner, of Denver, Colo., has been elected to the position of station photographer; W. J. Rutherford has been advanced to the position of associate professor of animal husbandry and professor in charge during Professor Kennedy's absence; and Carl W. Gay has been appointed temporary assistant during the latter's absence. Wayne Dinsmore, W. W. Smith, and J. A. Conover have also been elected assistants in the department of animal husbandry, and M. L. Merritt assistant in horticulture.

Contracts have been let for the erection of a new fireproof dairy building that will cost, when completed January 1, 1905, about $60,000; and a horticultural barn and storage room to cost about $6,000.

Michigan College and Station.—B. O. Longyear, the botanist of the station, has resigned to take up similar work with the Colorado Station. Professor Longyear had, before going, nearly completed a monograph on the fleshy fungi, part of which had been published as Bulletin 208. Another piece of unfinished work was a new key to the classification of vetches, nearly or quite completed, but awaiting the confirmation of this year's observation before publishing. His successor is not yet appointed. Among new lines of work undertaken by the station are: An investigation as to the causes and remedies for a disease of cattle on purely sandy areas, called the "Grand Traverse disease," the principal symptom of which is refusal of food and consequent inanition, a disease quite common in the northern central parts of the State; an investigation of the relation of the quality of the feed to the quality of the carcass in steers and lambs; and an investigation of the relation of fertilizers and other factors to the number and potentiality of the nodules on the roots of certain legumes.

Mississippi Station.—The branch station at McNeill was struck by lightning July 24, and the entire building was destroyed by fire. The station office and library were in the building, and the library was practically an entire loss. A second branch station has been located by the board at Holly Springs, but the work there will not be organized at present.

Missouri University.—H. W. Quaintance has been appointed instructor in economics, and during the next year will give a course of lectures in agricultual economics to

cover "the principles which underlie the prosperity of the farmer and of all other classes as far as they are dependent on agriculture."

Montana Station.—The station is just completing a large barn, which is built with an appropriation of $13,000. The building is an attractive one, and will be a great improvement over the dilapidated structures which formerly served for barns. The contract price was $11,400, not including the steam and water fittings, which will add about $500 more. The barn will accommodate about 75 head of stock, and is provided with cement floors, iron stable fittings, etc. A hog house and sheds for machinery have all so been put up.

Nebraska University and Station.—Good progress is being made in the erection of the $60,000 main building for the school of agriculture. The building will contain the executive offices of the experiment station, and offices and laboratories in animal pathology. The remainder will be devoted to instructional work of the school of agriculture. The completion of this building will leave the present station building to the departments of agriculture and agricultural chemistry, and give opportunity for equipping large laboratories for instruction and station work.

New Hampshire College and Station.—Harold H. Scudder has resigned his position as assistant chemist to enter newspaper work. Harry D. Batchelor, a graduate of this college in the class of 1903, has been appointed in his place. E. Dwight Sanderson, State entomologist of Texas, and entomologist of the Texas College and Station, has accepted the position of professor of entomology and zoology in the college and entomologist to the station, and will begin his duties November 1. He will succeed Clarence M. Weed, who has resigned to take charge of nature study work in the public schools of Lowell, Mass.

New Mexico College and Station.—John M. Scott, of the agricultural department, has been advanced to the position of first assistant, made vacant by the resignation of H. C. McLallen, who, as previously noted, has gone to the Wyoming Station. A. E. Lovett, a recent graduate of the Oklahoma Agricultural College, entered upon his duties as assistant in animal husbandry on July 1. F. O. Woodruff, formerly assistant chemist at the Nebraska Station, assumed the duties of assistant chemist the middle of June, vice C. L. Post, resigned. In June the pumping plant was run almost continuously for seven days and nights, throwing an average of 1,000 gal. per minute. The removal of this amount of water only lowered the surface of the water in the well 2 ft. below its position in one-day runs. A new 40-horsepower boiler and a 30-horsepower engine have been installed recently. This will allow the running of pumps on both wells at once, and raise the amount pumped to about 2,000 gal. per minute.

North Carolina College.—At the Summer School of the North Carolina College of Agriculture and Mechanic Arts, held during July, there was an enrollment of 977 teachers, of whom 477 took work in agriculture. Immediately following the Summer School a Farmers' Convention, with an enrollment of between 400 and 500 farmers, was held. This large attendance is an indication of the remarkable awakening in North Carolina along educational lines, and especially of the interest in agricultural education, which has been aroused during the past two or three years. As a further indication of this interest it is stated that the school authorities of several counties in the State voted to pay the tuition and most of the other expenses of such teachers as would attend this Summer School, but were prevented from carrying out their good intentions by a decision that the school funds could not legally be used in such a manner. According to a newspaper report, bids have been called for for the erection of an agricultural building at a cost of $50,000. Plans for the future development of the college campus have been made by a landscape gardener, and the new building will be located on his recommendation.

North Dakota College and Station.—W. B. Richards, of the Wisconsin Agricultural College, has been appointed assistant in animal husbandry in the college and station;

and F. J. Pritchard, a graduate of the University of Nebraska, who has lately been working under the agriculturist of the Nebraska Station, has been appointed assistant in botany and pathology.

Ohio University and Station.—H. A. Gossard, formerly of the Florida University and Station, has succeeded P. J. Parrott as entomologist, who, as previously noted, has gone to the New York State Station. A second annual meeting of the Ohio State Board of Agriculture, members of the faculty of the Ohio College of Agriculture, the farmers' institute lecturers of Ohio, and representatives of the agricultural press, was held at the station June 16 and 17, 1904. Addresses were made by John Hamilton, of this Office, and Cyril G. Hopkins, of the Illinois Station. S. H. Ellis, a former member of the board of control of the station and for 12 years its president, died on June 23 from injuries received in an accident.

Oregon College and Station.—At a recent meeting of the board, the department of botany, horticulture, and forestry was divided, the department of botany and forestry being established, with E. R. Lake in charge. The board also created a "station executive committee," consisting of the director, E. F. Pernot, and E. R. Lake, the duties of which are to direct and control the work of the station, subject to the approval of the president.

Rhode Island College and Station.—The college announces this year for the first time a four-year course in highway engineering, "intended to meet a definite and growing demand for men competent to build better roads." This is probably the first course of the kind ever offered in an American college. The work for this course in the freshman year differs little from the other courses in mechanic arts at the college. In the sophomore year the student begins the study of elementary surveying in the spring term. At the beginning of the junior year he is required to reach the college about two weeks in advance of the opening term in September and devote this time to surveying, including all the usual operations of simple triangulation, topographical, railroad, and highway surveys. During the college year in addition to English and mathematics, he will receive instruction in mineralogy and geology, with particular emphasis on road materials. Office work in platting and computation continues through the winter, and surveys are completed in the spring. The senior year is given over largely to highway engineering proper, and includes the study of stereotomy, masonry construction, strength of materials, theory of road building, hydraulics, highway bridges, and field practice. The recitation and laboratory work will be adjusted to accommodate the practice in construction which may occur in the fall or spring term. H. M. Soper, temporary assistant chemist, has resigned to accept a position elsewhere.

South Carolina College and Station.—J. S. Newman, vice-director and agriculturist, has resigned his connection with the college and station, to take effect next June. G. E. Nesom, veterinarian, has also resigned to accept the position of assistant chief of the Bureau of Agriculture in the Philippines.

Tennessee University and Station.—John R. Fain, assistant agriculturist, has resigned to become agriculturist at the Virginia Station and assistant professor of agriculture in the college; and P. O. Vanatter, plat expert, has resigned to accept a similar position at the Virginia Station.

Texas College.—J. W. Carson has succeeded E. R. Bennett in charge of the farmers' institute work of the State.

Virginia College and Station.—W. B. Alwood has resigned; his present address is Charlottesville, Va.

Washington College and Station.—N. O. Booth, horticulturist, has severed his connection with the college and station.

Wisconsin University and Station.—Walter S. Brown, of New York, has been appointed instructor in horticulture in the college of agriculture and assistant in horticulture in the station. He succeeds Frederic Cranefield, who, as already noted,

resigned to take the position of secretary of the Wisconsin State Horticultural Society.

Wyoming Station.—H. C. McLallen has resigned his position as assistant agriculturist, and will go to New Mexico, where he will operate a farm for himself. George E. Morton, a graduate of the Colorado Agricultural College and former student in the University of Wisconsin, has been appointed assistant in animal industry. B. P. Fleming, assistant in irrigation and irrigation engineer of the station, has been granted leave of absence for one year to pursue his studies and take an advanced degree in the East. Arrangements have been made with the Office of Experiment Stations for some cooperative work in drainage and the reclamation of alkali land at the station. It is expected that 20 acres of land which has been entirely destroyed by seepage and alkali will be drained and cropped for a period of 5 years. A research chemist, who will be assistant to the chemist of the university, will be appointed for work at the station the coming year. It is expected that the principal work taken up this year will be in studies of animal nutrition with stock foods raised at high altitudes. The station is located 7,187 ft. above the sea, and no work of the kind has been done heretofore in this country.

The past year the station has begun the breeding of horses experimentally, principally for the purpose of showing Western ranchmen how they can produce a general-purpose horse, and one suitable either for cavalry purposes or for work on the home ranch. It is thought the horse business in Wyoming can be made much more profitable than it is at present by improving the native stock with coach stallions and such warm blood as may be found necessary. To begin this work some coach stallions and grade mares were purchased last season. Unfortunately, glanders broke out in one of these mares, and the State veterinarian condemned and killed 3 mares and one of the station work horses in July. This will necessitate obtaining some new stock for breeding purposes.

Bureau of Chemistry, U. S. Department of Agriculture.—The order establishing the soil and fertilizer laboratory in the Bureau of Chemistry has been abrogated, and in lieu of this laboratory one to be known as the plant analysis laboratory has been established. The laboratory is charged with the examination of fertilizers and will collaborate in this work with the referees of the Association of Official Agricultural Chemists, and with the investigation of the constitution of plants. It is authorized to collaborate with the Bureau of Plant Industry in the chemical investigation of problems in which the two bureaus are mutually interested.

A leather and paper laboratory and a micro-chemical laboratory have also been established in this Bureau. The latter is charged with micro-chemical investigations relating to the investigations of the Bureau of Chemistry, and especially the examination of food products with respect to their composition and adulteration. To the leather and paper laboratory will be assigned analyses and investigations relating to tannins and tanning material, all technical problems of a chemical nature relating to the production of leather, chemical and physical examinations of papers with reference to their fitness for use in this and other Departments, and problems relating to the production of paper with a view to promoting the agricultural industries connected with the production of the raw materials and to the improvement of the quality of papers made.

Correspondence Courses in Agriculture.—The Columbian Correspondence College of this city announces 14 courses in agriculture, beginning with the opening of the current school year. These courses have with few exceptions been prepared by experts in this Department, and are as follows: (1) Plant life; (2) grasses and clovers, by F. H. Hillman, of the Bureau of Plant Industry; (3) soils, fertilizers, and manures, by L. J. Briggs, of the Bureau of Soils; (4) grain crops, by J. I. Schulte, of this Office; (5) poultry culture, by Horace Atwood, of the West Virginia College and Station; (6) vegetable gardening, by L. C. Corbett, of the Bureau of Plant Industry; (7) fruit

growing, by C. B. Smith, of this Office; (8) principles of stock feeding, by W. J. Spillman, of the Bureau of Plant Industry; (9) horse husbandry; (10) swine and sheep husbandry, by G. M. Rommel, of the Bureau of Animal Industry; (11) beef production, by E. V. Wilcox, of this Office; (12) veterinary science, by G. H. Hart, of the Bureau of Animal Industry; (13) the dairy herd and its care, by H. E. Alvord, of the Dairy Division, and (14) milk, butter, and cheese, by C. B. Lane, of the same division.

A New Agricultural School.—Oread is the name of a school for girls established at Worcester, Mass., in 1848, which has recently been moved to the Filston Farm, near Baltimore, Md. The institution has been reorganized and now includes a domestic science department for girls and women and a natural science department, including agriculture, industrial arts, and commerce, for boys and men. The subjects of instruction included under agriculture comprise drainage and irrigation, soils, crops, farm buildings and the home, marketing and accounts, horticulture, forestry, animal industry, dairying, poultry and bees, and veterinary science. The school has been endowed by Henry D. Perkey, who is also its president.

Agriculture at the British Association Meeting.—At the meeting this year of the British Association for the Advancement of Science there was for the first time in the history of the association a subsection devoted to agriculture, which was presided over by Dr. W. Somerville. The preliminary announcement of the meeting contained the following list of papers which had been promised: The Probable Error of Agricultural Field Experiments, an Analysis of the Soil by Means of the Plant, A. D. Hall, of the Rothamsted Station; The Influence of Sulphate as Manure upon the Yield and Feeding Value of Crops, and the Determination of the Availability of Insoluble Phosphate in Manures, T. S. Dymond; The Improvement of Wheats and Mendel's Laws, R. H. Biffen; The Clover Mystery—a Probable Solution of it, R. H. Elliot; Improvement of Clay Pastures through the Agency of Clovers, T. H. Middleton; and Chemical Composition of Root Crops, T. B. Wood and R. A. Berry.

New Society in France for Alimentary Hygiene and Nutrition of Man.—Recognizing the importance of studies on food and nutrition, a new scientific society has just been formed in France, which takes the name of The Society of Alimentary Hygiene and the Rational Nutrition of Man. The objects of this organization are the study and popularization of the best methods of scientific and economic nutrition of man in all conditions of life and of all ages, as well as the determination of the laws of hygiene in relation to nutrition and their social application. The society proposes to carry on studies in France and elsewhere, to found experiment stations and special laboratories, to offer prizes and other subsidies for the encouragement of work, to publish monographs and other technical works, to organize exhibitions and congresses, and to give scientific courses and lectures on its work and questions related to nutrition.

This organization was founded at the instigation of Dr. Ricard, senator from the Cote d'Or. The list of active members is limited to fifty; twenty associate members, French and foreign; one hundred corresponding members, and fifteen honorary members. It numbers among its founders some of the most representative men interested in physiological, hygienic, and medical studies.

This society is made up of five sections, namely, (1) Biological physics, (2) Physiology and biological chemistry, (3) Rational nutrition, (4) Chemical analysis of foods, and (5) Statistics of nutrition, including production, consumption of food, etc. Each section has a president and one or more vice presidents, Prof. L. Grandeau being president of the section of rational nutrition, and Prof. A. Gautier president of the section of physiology and biological chemistry. The president of the society is Dr. Ricard.

The founders of the society state that in determining upon its scope, methods, and objects they were very largely influenced by the nutrition investigations carried on in the United States, especially those of the Office of Experiment Stations, and, as

a recognition of this, Professor Atwater, chief of the nutrition investigations, was made an associate member.

The society publishes a journal entitled "*Revue de la Société Scientifique d'Hygiène alimentaire et de l'Alimentation rationelle de l'homme,*" which contains original articles and abstracts of current literature relating to the subjects in which the society is interested. Its foundation may be regarded as an illustration of the importance which the study of nutrition is assuming at the present time.

International Congress of Agricultural Mechanics.—It is proposed to hold an International Congress of Agricultural Mechanics at the Universal Exposition of Liège in 1905, under the patronage of the Belgian Government. The organization has, however, not yet been perfected nor the programme completed. A. Lonay, director of the provincial school of agricultural mechanics at Mons, is in charge of the preliminary arrangements. Among the topics which have been suggested for the programme are instruction in agricultural mechanics, testing stations for agricultural machinery, exhibition and tests of machinery, application of electricity, the traction automobile, and the establishment of a review of agricultural mechanics.

Personal Mention.—Alfred H. Allen, widely known for his treatise on Commercial Organic Analysis, a work in eight volumes, and the author of many papers on applied chemistry and food adulteration, died at Sheffield, England, July 14, at the age of sixty years.

The death is reported of Dr. Gustav Hempel, professor of agriculture at Vienna.

At the meeting of the British Association for the Advancement of Science, at Cambridge, August 17–24, and the International Physiological Congress at Brussels, August 29 to September 3, W. O. Atwater, in charge of the nutrition investigations of this Office, delivered addresses on the studies in the nutrition of man which are being carried on in this country.

Miscellaneous.—The committee authorized by the Texas legislature to pay a reward of $50,000 to the discoverer of a method for the extermination of the cotton-boll weevil has decided that no one has earned this reward.

The report of the Mosely Educational Commission, as given by Dr. Henry E. Armstrong in *Science* for August 5, while it expresses a high appreciation of the work being done for agriculture in this country by investigation and by the various agencies for the dissemination of information, contains statements which, doubtless unintentionally, fail to give full credit to the character of the work the experiment stations are doing. It says: "Much research work is also done in the State experiment stations; in the main, however, these serve to bring under the notice of farmers the importance of science to agriculture by demonstrating the value of methods of cultivation, manures, etc."

In commenting upon the pamphlet recently issued describing the collective exhibit of the colleges of agriculture and mechanic arts and the experiment stations at St. Louis, *Science* says: "It is probably the most complete and comprehensive display of its kind that has ever been attempted, and is believed to furnish an instructive exposition of a phase of educational and scientific effort which is rapidly extending and is already exerting a potential influence in developing the industries and resources of the country. It is safe to say that in no special field of education and research has there been greater progress during the past decade than along the agricultural, industrial, and technological lines represented by the land-grant colleges and experiment stations."

We learn from *Le Jardin* that a school of horticulture for women will be established at Cassel, Germany, this fall. In addition to the course in horticulture there will be courses in arboriculture, pomology, domestic economy, dairying, and poultry management. The school will be modeled after the best institutions of its kind, and supplied with modern equipment. It will not only teach the essentials of horticulture, but is designed also to supply professional gardeners.

The medical faculty of the University of Munich offers a prize for research on the nutrition of pigeons with chemically pure food stuffs (albumin, fats, carbohydrates, mineral salts, and water). In announcing the subject attention is called to the claim that mice can not be adequately nourished on such chemically pure foods, although there is a difference of opinion among investigators upon this point.

A board of agriculture has recently been established in the Bahamas, and a botanical station is to be started in connection with it. The station will be under the supervision of the Imperial Commissioner of Agriculture for the West Indies.

Through *Science* we note that Sir Thomas Elliott, for the British Board of Agriculture, in a reply to the Association of Chambers of Commerce, who urged the importance of establishing a national school of forestry, stated that through the agency of the commissioners of woods and forests a school of forestry had been established in the Forest of Dean, and that a movement is on foot for securing a suitable area of land in Scotland for the purpose of demonstrating scientific forestry. "The board has taken steps to secure the establishment of at least two lectureships in forestry in England, and some of the leading universities and agricultural colleges have been giving attention to proposals under this head. The agricultural departments of the University College of North Wales, Bangor, and of the Durham College of Science, Newcastle-upon-Tyne, appeared to offer special advantages as centers of instruction in forestry, and grants in aid of the establishment of schemes of education in the subject will be made by the board to those institutions. The board hopes that the arrangements thus made will result in a considerable improvement of the facilities available in this country for the acquirement of a knowledge of practical forestry."

Nature gives an account of the opening of the new hall of the Royal Horticultural Society in Vincent Square, Westminster, on July 22. The building includes a library, offices, council chambers, and a lecture room, in addition to the large hall in which the society will hold its fortnightly exhibitions. It was built to celebrate the centenary of the society, the funds being raised by subscription. The ultimate cost will be about £40,000, and of this amount £26,000 have been subscribed. It is said to be the intention of the society to provide scientific instruction, as well as practical training, in connection with the gardens at Wisley.

A laboratory for beet sugar manufacture has been opened in connection with the Agricultural High School at Berlin.

The chair of plant physiology, formerly occupied by P. P. Dehérain in the Museum of Natural History, has been changed by official decree to a chair of cryptogamic botany, and L. Mangin has been appointed its first occupant. The instruction in agronomy is continued by L. Maquenne.

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EXPERIMENT STATION RECORD.

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We are again called upon to pay tribute to the memory of one of the pioneers in agricultural education and experimentation in this country, who was in many ways a leader in the early period of development. The sudden and premature death of Maj. Henry E. Alvord caused widespread and deep regret, and especially among the institutions for agricultural education and research. First associated with one of these institutions as military officer in charge of the instruction in military tactics prescribed by the Morrill Act, he later gained distinction as a teacher in the more peaceful art of agriculture, and subsequently as an executive officer had the direction of both instruction and experimentation in agriculture.

Major Alvord's career was a varied one. He was born at Greenfield, Mass., March 11, 1844. Graduating from Norwich University, Vermont, with the degrees of B. S. and C. E., he entered the Army as a private in 1862, and before the close of the war had been advanced to the rank of major of the Second Massachusetts Cavalry. After the war he remained in the Regular Army as captain of cavalry until 1872, being assigned to service in the Southwest for quite a part of the time. It was during this period, from 1869 to 1871, that he was detailed as military instructor at the Massachusetts Agricultural College, being the first army officer detailed to an agricultural college for this service. While there he became much interested in the study of agriculture, and attended the various lecture courses on that subject which were then given at the college. Subsequently his tastes attracted him especially to dairying and the breeding of dairy cattle.

During the eight years following his resignation from the Army, while engaged as instructor in the scientific department of Williston Seminary at Easthampton, Mass., he found time to pursue his work in this new field, and by his writings and his public speaking gained considerable reputation as an agricultural expert. It was during this time that he wrote the American chapters of Sheldon's Dairy Farming. In the early days of the Chautauqua movement he was in charge of the agricultural branch of its reading courses, known as its "School of Farming." The three years' course of reading and examinations

which he worked out included experiments by the pupils and correspondence with the "director" of the course, and was probably the first correspondence course in agriculture undertaken in this country.

Major Alvord was greatly interested in the cooperative creamery system of butter making, which was attracting attention at that time, and became an ardent advocate of the cooperative system of dairying throughout New England. He established the first creamery east of the Hudson River, and was a leading spirit in the organizing of many others in Massachusetts, Vermont, and Maine.

On the establishment of the Houghton Farm Experiment Station in 1880 Major Alvord became general manager, remaining at its head until the project had to be abandoned in 1885 for lack of funds. In that year he was appointed professor of agriculture at the Massachusetts Agricultural College, where he remained for two years, resigning in 1887. He was elected director of the experiment station at Cornell University, upon its establishment under the Hatch Act, but declined the position to accept the presidency of the Maryland Agricultural College. He reorganized that institution and established the experiment station, occupying the position of president and director until 1892. He was afterwards temporarily in charge of the Oklahoma Agricultural College and Experiment Station, and went from there to the New Hampshire Agricultural College in 1894 as professor of agriculture, where he remained for a short time.

Few men were more prominently identified with the Federal legislation relating to the agricultural colleges and experiment stations than Major Alvord. He was prominent in the meetings preceding the formation of the Association of American Agricultural Colleges and Experiment Stations, and on the organization of that association he became chairman of its executive committee, discharging that office for eight years. During this time his judgment as a man of affairs, and his familiarity with methods of securing legislation, made him of great service in promoting the movements which resulted in the national endowment of the agricultural colleges and the experiment stations. He had what may be called the military habit or cast of mind. He made clear and detailed plans of work, was quick and firm in decision, and authoritative in manner and speech. He was thus qualified for leadership, and exerted a considerable influence in whatever enterprise he was engaged.

He was president of the Association of American Agricultural Colleges and Experiment Stations in 1894, which marked the termination of his connection with that body and with the institutions represented by it. In 1895 he was appointed Chief of the Dairy Division, which Congress had authorized to be established in the Bureau of Animal Industry of this Department. He organized this division and its work,

and was at its head at the time of his death. Here the same systematic and orderly business methods, attention to details, and conscientious and fearless attitude were evident in whatever he undertook. The efficiency of the division was due in large measure to his constructive and executive ability, and to his deep insight into the dairy conditions and needs of the country.

He was sent abroad in 1900 as a representative of this Department at the Paris Exposition, and was a member of the international jury of awards. In that year he traveled quite extensively in Europe studying dairy institutions and conditions. At the time of his death he was in attendance at the St. Louis Exposition, where he had been busily engaged upon the jury of awards. He was stricken with paralysis on the afternoon of September 28, and lingered in the hospital until October 1, when he died.

Major Alvord was a member of numerous scientific and dairy associations in this country and abroad, was a medalist of the Royal Agricultural Society of England and the British Dairy Farmers' Association, an "officer" of the National Order of Mérite Agricole of France, and was lately honored by his alma mater with the degree of LL. D. His genial nature and cordial manner won for him a very wide circle of friends; and his writings and his public services ranked him among the foremost authorities on dairying and dairy cattle in this country.

If any incentive were needed to induce young men to enter upon the study of agriculture, or any indication necessary to show the demand for men of agricultural training, it would be furnished by the record of the past summer. At hardly any time since the stations were organized and fairly running has there been a greater call for men of various grades and qualifications. A part of this call has arisen from the growth of agricultural instruction, and the reorganization of several institutions on a broader basis.

A notable feature of the present demand is the high degree of efficiency which is called for. In many cases specialists are desired, who bring to their work a combination of special training and experience not easily acquired at college. Frequently such men have had to be trained for the work after leaving college; and while this will probably be inevitable for certain positions, the enlarging of the facilities at the agricultural colleges, in teaching force and equipment, and the provision for more efficient post-graduate work, will enable the training in special lines to be carried much further.

It is gratifying to note that with the growing appreciation of trained men for various agricultural pursuits has come a greater interest in agricultural education on the part of young men. This is indicated in a rather striking manner by the attendance at many of the leading agricultural colleges this fall. As a rule, the number in the entering

class who have elected agriculture shows a marked increase, often far in advance of previous years. The University of Illinois, for example, reports 130 agricultural students in its entering class, as compared with 138 in the whole college of agriculture two years ago; Iowa Agricultural College entered 155, as compared with 128 last year; Massachusetts, 78; Michigan, 42 in the freshman and 66 in the subfreshman classes; Missouri, 60, as compared with 44 last year; Ohio, 45; and Texas, 60, as compared with 18 last year. The above figures apply to students in the entering classes who have elected the four-year courses in agriculture and horticulture.

Other colleges report a marked increase in the total number of agricultural students. At Cornell University the number has increased about 30 per cent, making the total 175; at the Alabama College the total is about 135, as compared with 125 last year; at Clemson College, South Carolina, 137—a considerable increase; and at the University of Wisconsin there are 88 students in the long course, against 60 last year.

While these numbers are not large relatively, they indicate a marked change over conditions a few years ago; and it should be noted that in the majority of cases the registration has increased in spite of more and more rigid requirements for admission, which are now as strict as for any other course in the institutions mentioned. The differentiation of the agricultural course is now so much more complete than formerly that in most instances the men who elect agriculture do so because they are seeking an agricultural education, and not because they are forced to take this course in order to get a training in general science, as was frequently the case a few years ago, or because it furnishes an easier road to a degree. This adds force to the figures presented above, and indicates that the placing of the agricultural course on a level with other college courses in point of entrance requirements and grade of work is meeting with very encouraging results.

The two-year courses and the short winter courses are serving a most admirable purpose, and are increasing the army of trained agriculturists, who put the teachings of the agricultural colleges and the experiment stations, and other agencies for agricultural advancement into practical application. But the regular college course must be looked to to furnish the leaders in the higher agricultural work, and to man the colleges, stations, and other agricultural institutions. That there is still abundant encouragement to pursue this course, and to follow it by post-graduate work in special lines, is evidenced by the difficulty in meeting the demand for properly equipped men in various lines of administrative, educational, and experimental work.

ANNUAL MEETING OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION.

E. V. Wilcox, Ph D.,
Office of Experiment Stations.

The forty-first meeting of this association was held in St. Louis August 16–19, 1904. The attendance was larger than at any other meeting in the history of the association, and the interest manifested in the discussion of papers was very gratifying.

On the first day the usual order of business was observed, beginning with an address of welcome by a representative of the Chamber of Commerce of St. Louis, followed by a response by W. H. Dalrymple, the reports of committees and outgoing officers, as well as of State secretaries, and closing with the election of the following officers for 1904–5: President, M. E. Knowles; vice-presidents, J. G. Rutherford, E. M. Ranck, G. W. Dunphy, G. R. Young, R. P. Lyman; secretary, J. J. Repp; treasurer, W. H. Lowe.

The presidential address by R. R. Bell contained a discussion of the present status of the veterinary profession. The speaker called attention to the observed fact that veterinarians at present receive more respect from their clients and from the world at large than ever before. This condition is apparently due to improvement in the character and qualifications of the veterinarians themselves. The horse is also valued more highly than ever, despite the popularity of automobiles, and higher prices are willingly paid for professional services in keeping the horse in health. Veterinarians exercise a great influence in the prevention of animal plagues, particularly those which are common to animals and man.

Reviewing the history of veterinary schools and institutions, the speaker urged that diplomas should be standardized so as to have a more uniform value. To this end he recommended the reestablishment of the association of veterinary faculties in cooperation with the association of veterinary medicine.

The committee on intelligence and education, E. B. Ackerman, chairman, reported that veterinary catalogues had been collected and a long list of questions relative to veterinary courses addressed to twenty veterinary colleges. Detailed comments were made on each of these institutions, and suggestions were made regarding needed improvements in their courses of instruction. In many institutions the courses were considered very defective, and the institutions themselves were severely criticised.

The committee on diseases, C. H. Higgins, chairman, presented a report covering several subjects, edited by different individuals. Actinobacillosis was reported by Doctor Higgins as having occurred in various parts of Canada. The germ in five outbreaks which were studied in Canada was not very virulent. Laboratory animals died within 12 to 25 days after artificial inoculation. The lesions were very characteristic when examined under the microscope. It was considered an easy matter to distinguish by the gross symptoms between actinobacillosis and actinomycosis. E. S. Wheeler reported that ovarian cysts had been found to be the cause of nymphomania in cows in many cases, although pathological conditions do not always cause nymphomania. In the majority of cases a cure was brought about by operation and removal of the cysts.

The history of infectious abortion was discussed in considerable detail by V. A. Moore, who considered it one of the most important diseases of cattle. It is characterized by lesions of the uterine and fetal mucous membranes. The colon bacillus was not found in any of 14 cases, while numerous micrococci and streptococci were observed. Artificial infection of experimental animals was unsuccessful, despite numerous attempts. It was found, in conversation with dairymen, that the contagiousness of the disease is not generally admitted. In the speaker's experience contagious abortion yields readily to disinfectant treatment. The uterine and fetal lesions reported by European investigators were not observed in the United States.

A. R. Ward presented a report on poultry diseases, calling attention to their great importance and to the recent establishment of a poultry experiment station in California. Poultry diseases require more study in order to obtain a thorough knowledge of their nature. The tuberculin test is not reliable when applied to fowls, on account of the great variation in temperature in these animals. Tuberculosis is apparently spreading among fowls by traffic in laying hens. The speaker recommended the isolation of chickens from old hens, and maintained that tuberculosis was not transmitted through the eggs. Fowl cholera was mentioned as the next most important disease of chickens, which may be controlled by thorough disinfection and by the destruction of dead fowls.

The committee on pharmacopœia, E. M. Ranck, chairman, reported that after careful consideration of this question it was considered impracticable to publish a book on the subject of veterinary pharmacopœia. The work required too much time and money to be taken up officially by the association. The committee was therefore discontinued.

The committee on mutual aid association reported that the assessment plan of mutual aid to veterinarians was considered impracticable, and the committee was therefore discharged.

The secretary, J. J. Repp, in his report stated that the resident secretaries had devoted an unusual amount of time to securing additional members to the association and improving the programme of the annual meetings. The plan of assigning the opening of the discussion of each paper to two members was adopted for the purpose of stimulating the discussion and awakening a wider interest in the papers. It was recommended that the executive committee at each meeting name certain subjects to be discussed at the next annual meeting.

A number of State secretaries made reports regarding the veterinary conditions in different parts of the country. In these reports mention was made of progress in State laws for the control of animal diseases, laws regulating veterinary practice, veterinary education, the general health of animals, and the most noteworthy animal diseases during the year. Among the latter were verminous bronchitis in calves in California, glanders in Florida and Kansas, influenza in Kentucky, rabies in Michigan, forage poisoning in Mississippi, cattle mange in Nebraska, and Texas fever in Tennessee. In Arizona the presence of swamp fever was noted in one valley. This disease is believed to be identical with that observed in Minnesota and Manitoba. In Montana a disease of sheep known as crusta labialis has been observed in various counties. Experiments in immunizing cattle against tuberculosis have been continued in Pennsylvania, 100 animals being used for this purpose. The results thus far obtained are very promising, and a State commission composed of 18 men has been appointed for the purpose of making a further investigation of this problem.

Dr. K. Tsuno, veterinary representative of the Japanese Empire, was present at all the sessions and presented a report on animal diseases and quarantine laws in Japan. So-called farcy of horses prevails to a considerable extent in that country, and infected animals do not react to mallein. The speaker recommended that the disease be preferably called false farcy. Before foreign animals were allowed to enter Japan there was no rabies, farcy, or other serious contagious disease among Japanese native animals. Foot-and-mouth disease was introduced from the Asiatic continent, and cattle plague from Korea in 1892. Sanitary measures and quarantine laws have recently been passed, but until 1897 these laws were not well calculated to prevent the introduction of serious diseases. Tuberculosis is not known in native Japanese cattle. When introduced by foreign cattle it has been found to yield to the Bang method of prevention.

L. A. Merillat presented a paper on When to Operate. Attention was called to the desirability of papers on veterinary surgery, to be presented before the annual meetings of the association. The dangers of hasty operation were outlined, and the value of surgery was held

to depend largely upon being applied with caution. All operations entailed certain dangers and should not be called trivial. The conditions surrounding each case should always be carefully noted before operation. Care was urged in the use of anesthetics. Detailed suggestions were made regarding operations in pneumonia, periodic ophthalmia, fistula, quittor, luxation of the patella, goiter, roaring, and other surgical diseases. The ordinary clinics as held at the annual meetings of the association were severely criticized, for the reason that the operations are usually performed under unsatisfactory conditions, so that they do not represent the best practice of veterinary surgery.

A paper was read by J. M. Parker on Creeps, an Osteomalacial Disease of Cattle. Creeps appears in winter and early spring in certain parts of Texas. Pregnant cows appear to be most susceptible. In some localities 50 per cent of such cows are affected. Creeps is apparently identical with osteomalacia. The soil and forage conditions of the locality in which the disease occurs were carefully described. No breeds of cattle are especially susceptible. The first symptom of the disease is lameness. Poor animals are most often affected. Bones of the legs and the ribs break easily. The fat of affected animals tastes like pork, and the bone marrow becomes yellow and hemorrhagic. The etiology of the disease is unknown and no successful treatment has been devised except a palliative one, consisting of the use of better rations.

Immunization against tuberculosis was discussed by L. Pearson. Work along this line has been carried on for a number of years in Pennsylvania. More than 100 cattle have been used in these experiments and some of them have been kept under continual observation since 1900. These cattle have been treated in various ways by living and dead tubercle bacilli, virulent and nonvirulent for cattle. It has been found possible by means of five inoculations of human tubercle bacilli to immunize cattle so that they remain alive for one year when exposed to natural infection. Immunized cattle also stand large doses of virulent cultures without developing tuberculous lesions, except after the use of immense doses. The immunity thus produced is very high, but not absolute. Some time is required for its production. The method is considered to be still in the experimental stage, but is believed to be of practical application.

G. H. Glover presented a discussion of the cattle-mange problem of the West. Scab of cattle is becoming more and more serious in Colorado. In some localities a loss of 15 per cent is reported. An outline was given of plans for future work in controlling this disease, including a discussion of the conditions which prevail on the range. Mange shows its worst symptoms during times when feed is poor and animals in bad condition. Apparently negative results were obtained in attempting to transmit the disease to healthy cattle. The difficul-

ties of controlling it in range cattle were outlined. Cattle may easily become reinfected after the mange mites have been destroyed by dipping. Compulsory dipping before shipment is considered an unnecessary hardship for the cattlemen of Colorado.

N. S. Mayo discussed the same problem as it occurs in Kansas. He considered quarantine and dipping as absolutely necessary. The cage and the swimming-vat methods have been employed. The swimming vats should be from 40 to 60 feet long. The most effective, cheapest, and least injurious dip is the homemade lime-and-sulphur dip. Coal-tar dips are considered objectionable on account of their odor, the variation in strength, the irritation which they cause to the skin, and their excessive cost. Most of them cost from two to three times as much as the lime-and-sulphur dip. It was recommended that the dip be made so as to show a slight excess of sulphur. Cattle should be dipped twice, ten days apart, in the spring, with the dip at a temperature of 110° F. Cotton-seed oil was found to be effective as a dip, but was rather too expensive. Hand treatment, in the speaker's opinion, was of little value. Well-fed cattle frequently become affected. Apparent recovery is always followed by a recurrence of the scab, and infection is hard to detect during the summer months. Proprietary medicines are considered a nuisance in connection with this disease.

In discussing this paper, J. G. Rutherford also stated that fat cattle could become infected. In northwest Canada it is impossible to dip cattle in the spring. The Canadian regulations require that veterinary officials collect and dip stray cattle or cattle of owners who, for any reason, fail to dip. The lime-and-sulphur dip was considered the most effective, but hand treatment also gave good results under certain circumstances.

M. E. Knowles stated that hand treatment with dynamo oil had been successful with him in 4,000 cases. To the dynamo oil about 2 per cent of sulphur is added. The best method, in the speaker's experience, for keeping the dip warm was by the use of a caloric transformer as employed by brewers. The dipping vats in Montana contain from 10,000 to 30,000 gallons of water. N. S. Mayo reported that he had had better results with ordinary steam pipes than with the caloric transformer, but preferred a tank furnace, and strongly recommended a dip formula containing 12 pounds of lime and 20 pounds of sulphur.

A. T. Peters found by extensive correspondence with cattle raisers that a very low percentage of sulphur was used in some homemade dips. A formula has been devised for the preparation of a lime-sulphur dip which may be manufactured by commercial firms so as to have a standard strength.

A communication was received from A. Liautard on needed reforms in veterinary education in the United States. The author reviewed

the work of the veterinary schools in this country, calling attention to the difficulties in the way of reforms. The possible influence of the association in veterinary education was outlined. Comments were made on the entrance requirements and length and thoroughness of the curriculum of various veterinary schools, which it was held showed too great variations. The instruction as outlined in catalogues is often altogether too pretentious. too much subdivided, and the course too short, with irregular graduate courses. The courses in a few of the better veterinary schools were approved as excellent.

In discussing this paper, J. Law stated that the author was qualified to criticise American veterinary schools from his extensive experience in this country and abroad. Attention was called to the fact that educational institutions are well supported both by brains and money in this country, and that students' fees are inadequate to maintain veterinary schools on a suitable basis. Veterinary practice demands an education equal to that of any other profession. The standards may be fixed by State legislatures, and the association can recommend but not enforce uniformity in veterinary schools.

A. R. Ward presented a paper on Roup in Fowls. Roup has been shown to be distinct from human diphtheria. The anatomy of the chicken's head is considered of great importance in relation to the occurrence and treatment of the disease. During the development of roup the suborbital sinus becomes greatly distended, and may be opened to relieve the most serious symptoms. The remedies for roup must be cheap in order to be of general application. The head may be dipped in a 2 per cent solution of potassium permanganate for 10 to 15 seconds. A 2 per cent solution of creolin affected a cure in only 1 out of 12 cases. In another test chickens were given a permanganate treatment 6 times during 16 days, without good results. Roup is widely distributed in California. In one flock, 60 per cent of the fowls were affected. In treating this flock a 2 per cent solution of copper sulphate gave no results. A similar failure resulted in the use of turpentine and spirits of camphor, while kerosene appeared to cure about one-half of the cases. In one outbreak, 91 hens were treated 3 times with kerosene, with the result that 61 per cent were cured. Kerosene thus appears to be the best remedy for roup. Tincture of iodin was also quite effective in certain outbreaks of the disease. Roup is not easily communicated by intimate association. It was not found possible to prevent its spread by the use of corrosive sublimate in the drinking water in proportion of 1 to 2,000. Quarantine and isolation of sick fowls gave the best results, in connection with thorough disinfection.

In discussing this subject, V. A. Moore stated that in his practice the best results have been obtained from the thorough application of disinfection. From an etiological standpoint roup appears not to be a

specific disease, but due to various causes. It is found impossible to transmit the disease by artificial inoculation.

In a paper on the clinical study of blood, V. A. Moore called attention to the importance of such study in the diagnosis of human and animal diseases. The author's work was largely confined to the horse. It was found desirable to take blood samples from the capillaries of the skin to determine the number of red blood corpuscles. The amount of hemoglobin was then determined. Special attention was given to the study of normal variations. The red blood corpuscles were found to vary from 7,000,000 to 9,000,000 per cubic millimeter, and the total leucocytes from 4,000 to 6,000, while the average number of red blood corpuscles were 7,944,000 per cubic millimeter. In suppurative process the polynuclear cells increase, while the eosinophiles decrease in numbers. In pneumonia the latter cells completely disappear, while in cachexia the red corpuscles may become as few as 2,000,000 per cubic millimeter. Surgical operation under chloroform has the effect of greatly increasing the number of red corpuscles. A differential count of the blood elements is considered of great assistance in diagnosis.

F. F. Brown read a paper on Mallein as a Cure for Glanders. Mallein was used in testing 301 horses which were killed for glanders in Kansas City in 1903. In 149 cases the temperature reached 102° F. or more, and varied from that to 106° F. Sixty-five of these animals were again tested after 30 days, and in 64 of them the temperature reached 103° F. or more. From subsequent history of these and other cases the speaker believed that glanders may be cured by the use of mallein.

In discussing this question, C. H. Higgins stated that 3,147 horses had been tested in Canada, with a reaction in 592 cases. A large percentage of these horses ceased to react in later tests. In Canada the second test is applied after 40 days, the third after 100 days, and the fourth after 190 days. J. G. Rutherford, continuing the discussion, urged care in discharging ceased reactors. Some Canadian restrictions are removed in case of these animals; but horses which react with a temperature of 105° F. at the first test seldom recover. Of 730 reacting horses, 181 ceased to react after subsequent tests; but this percentage is not considered sufficient to pay for repeated inspections and tests. It is recommended, therefore, that all reacting horses be killed. In the future the Canadian Government will pay no indemnity for cases with clinical symptoms, while reactors without clinical symptoms will be paid for at the rate of two-thirds of their value.

C. C. Lyford discussed the subject of quittors and sidebones. These diseases, in the speaker's opinion, can not be cured with medicaments. It is recommended that the lateral cartilage be excised. The foot must be previously prepared by softening. Where possible, the division of

the coronary band should be avoided. After operation the wound may be dressed with witch-hazel and boracic acid. As a result of this operation, the horse is unfitted for work for a period of from 4 to 6 weeks.

C. H. Jewell discussed veterinary medicine and surgery in the Philippines. Surra first occurred in the Philippines in 1901. The disease is carried chiefly by stable flies and affects about 50 per cent of the caribao. Affected horses show a temperature of 105° F., and the blood parasite is readily demonstrated. The symptoms of the disease were described in detail. No success was had in destroying the blood parasite by the use of drugs. Contagious lymphangitis due to a species of cryptococcus is frequently miscalled farcy. The affected animals should be immediately isolated and the nodules cauterized and subsequently treated with antiseptics. Notes were also given on canker, thrush, glanders, eye diseases, pneumonia, and wounds.

The conditions of veterinary practice in the Philippines were also discussed by J. H. Gould. Sanitation in the Philippines is very poor, and the natives are unable to pay for veterinary services. As a rule, therefore, it is necessary for the veterinarian to have some source of income other than ordinary practice.

A simple and effective live-stock sanitary law was discussed in a paper by A. W. Bitting. In Indiana the decision of the State veterinarian is final in all cases, and this law has been found to be wholly satisfactory. In discussing the paper, J. I. Gibson stated that he considered the Indiana law an effective one, but suggested that the State veterinarian ought not to apply treatment in the case of ordinary diseases. It was also suggested in discussing the subject, that the State veterinarian should receive the support of some of the live-stock board in order to lend his decisions more weight and to prevent the development of litigation in disputed cases.

G. E. Nesom discussed the comparative virulence of the Texas-fever parasite. Texas fever frequently occurs among tick-free native cattle in South Carolina. A study of the ticks in certain localities showed that they were not virulent on account of the presence of a nonvirulent form of *Pyrosoma bigeminum*. The virulence of this parasite may be increased by passage through generations of ticks on different cattle. Its virulence may also be diminished in ticks which live under unfavorable conditions.

In discussing this paper, J. C. Norton referred to an outbreak of Texas fever in Arizona, during which evidence was obtained to show that the virulence of the Texas-fever parasite may be entirely lost under certain conditions.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Estimation of nitrogen by Kjeldahl's method (*Trans. Guinness Res. Lab., 1 (1903), pp. 13–16; abs. in Jour. Chem. Soc.* [*London*], *86 (1904), No. 500, II, pp. 443, 444*).—A distillation apparatus for use in Gunning's modification of the Kjeldahl method is described, and precautions to be observed in order to prevent loss of nitrogen when dealing with bulky materials are given.

Distilling apparatus for the Kjeldahl method of determining nitrogen, E. Blanck (*Chem. Ztg., 28 (1904), No. 34, p. 406, fig. 1; abs. in Jour. Chem. Soc.* [*London*], *86 (1904), No. 500, II, p. 444*).—The digestion flask is fitted with a rubber stopper double-bored to receive a tap funnel through which the alkali and the potassium sulphid are introduced, and for connection with the distillation apparatus. At the beginning of the distillation water is allowed to run through the condenser at full speed, but toward the end it is made to run slowly while the contents of the flask are more vigorously boiled.

A Kjeldahl apparatus, M. Siegfried (*Ztschr. Physiol. Chem., 41 (1904), No. 1–2, pp. 1, 2, pl. 1; abs. in Jour. Chem. Soc.* [*London*], *86 (1904), No. 500, II, p. 444*).—A device driven by water or electric motor for imparting a swinging motion to Kjeldahl flasks to prevent bumping is described.

A new method of estimating hippuric acid, T. Pfeiffer, C. Bloch, and R. Riecke (*Mitt. Landw. Inst. Univ. Breslau, 2 (1903), No. 2, pp. 273–293*).—A method is proposed which, according to the authors, gives very accurate results.

Concerning the estimation of fat in animal tissues, feeding stuffs, and the like, T. Pfeiffer and R. Riecke (*Mitt. Landw. Inst. Univ. Breslau, 2 (1903), No. 2, pp. 295–304, fig. 1*).—A form of fat-extraction apparatus is described, which, according to the authors, gives very satisfactory results.

Methods of determining sulphur in organic substances, M. E. Pozzi-Escot (*Rev. Gén. Chim. Appl., 7 (1904), pp. 240, 241; abs. in Chem. Centbl., 1904, II, No. 1, p. 62*).—The author points out the disadvantages of various methods heretofore proposed. He describes a method of oxidation by means of nascent chromyl chlorid, which gives good results with volatile compounds. In this method 1 gm. of the substance is mixed in a 500 cc. flask with 10 to 15 times its weight of pure dry chromic acid. Then 20 to 25 cc. of pure and highly concentrated hydrochloric acid is added, shaken vigorously for a few minutes, and allowed to stand 20 to 30 minutes. The flask is connected with a reflux condenser and heated at boiling temperature for 10 minutes. If the chromic acid is in excess, the sulphur is completely converted into sulphuric acid by this treatment.

The determination of argon in atmospheric air, H. Moissan (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 12, pp. 729–735*).—Methods of taking samples of air and determining argon are described, with results of examinations of samples of air from widely separated parts of the world. The method is based upon the complete absorption of oxygen and nitrogen by metallic calcium. A measured quantity of approximately 1 liter of air is drawn through 2 tubes maintained at a low red heat, the first of which contains a mixture of quicklime and magnesium and the second

about 1 gm. of calcium in very small crystals. The residue of argon is measured over mercury in an apparatus similar to that of Regnault and Schloesing. In the determinations reported the proportion of argon varies from 0.9305 to 0.9492 per cent.

Conversion tables for calculating fertilizer and feed-stuff analyses, H. B. McDonnell (*Maryland Agr. Col. Quart., 1904, No. 24, pp. 16*).—This is a reprint of tables first published in Bulletin 30 of the Maryland Station, the tables for potash having been recalculated, using the revised official factor for K_2O from K_2PtCl_6.

The valuation of feeding stuffs, T. Pfeiffer (*Mitt. Landw. Inst. Univ. Breslau, 2 (1903), No. 2, pp. 257–271*).—A method of calculating the value of feeding stuffs, taking into account their manurial value.

Investigation of the bodies called fiber and carbohydrates in feeding stuffs, with a tentative determination of the components of each, P. Schweitzer (*Missouri Sta. Rpt. 1903, pp. 8–26*).—Previously abstracted from another source (E. S. R., 15, p. 848).

A comparison of the halogen absorption of oils by the Hübl, Wijs, Hanus, and McIlhiney methods, L. M. Tolman (*Jour. Amer. Chem. Soc., 26 (1904), No. 7, pp. 826–837*).—This is a brief account of work previously noted from another source (E. S. R., 15, p. 438).

The determination of water in substances that are to be afterwards extracted with volatile solvents, R. M. Bird (*Jour. Amer. Chem. Soc., 26 (1904), No. 7, pp. 818–826, pl. 1, fig. 1*).—An apparatus devised for the purpose of avoiding the transferring of butter from the drying dish to the extraction apparatus is described and illustrated. While devised for use in butter analysis, the method is also applicable to various other substances, and is believed to be as accurate as the official method of the Association of Official Agricultural Chemists, and to require much less time.

Contribution to the question of Gottlieb or Adams, L. F. Rosengren (*Rev. Gén. Lait, 3 (1904), No. 15, pp. 337–344*).—The experimental work of the author agrees with results published by others, that when milk has been subjected to considerable agitation, as in churning, marked differences are found in the determination of fat by the Gottlieb and Adams methods.

Two theories have been advanced to explain this result, namely, that the small fat globules are encased in dried casein, which prevents their extraction by ether, and that other substances than fat are extracted. The author holds to the former view. The fat obtained from a large number of samples analyzed by the Gottlieb method was collected and dissolved in ether, the insoluble matter amounting to 0.002 to 0.004 per cent of the original milk. This residue was found to be very different from the nitrogenous material obtained by Storch from cream by repeated washing with water and centrifuging.

The residue was found to consist almost entirely of lecithin, while in the material obtained by the method of Storch the nitrogen content varied between 11 and 14 per cent. The material obtained by the method of Storch is, therefore, not believed to be the cause of the higher results obtained by the Gottlieb method.

The cryoscopy of milk, J. Winter and E. Parmentier (*Rev. Gén. Lait, 3 (1904), Nos. 9, pp. 193–200; 10, pp. 217–224; 11, pp. 241–247; 12, pp. 268–274*).—An extended study was made of the application of cryoscopy to the examination of milk. Historical notes are given and the technique of the method employed is described. Numerous determinations of the freezing point of pure and adulterated or modified milk are reported. Cryoscopy is believed to have many practical applications in the examination of milk and in the prevention of adulteration.

Determination of citric acid in milk, M. Beau (*Rev. Gén. Lait, 3 (1904), No. 17, pp. 385–396*).—The author reviews the literature relating to the presence of citric acid in milk and describes a modified method used by him, based upon the oxidation of the citric acid by potassium permanganate and the precipitation of the resulting

product by mercuric sulphate, the precipitate being collected, dried, and weighed, or, preferably, dissolved in hydrochloric acid and the mercury determined volumetrically in the solution.

Determination of dirt in milk, M. BALLO (*Oesterr. Chem. Ztg., 7 (1904), No. 5, pp. 101, 102*).—The milk is filtered through fine bolting cloth previously moistened with water, the dirt is washed with water and with alcohol and ether, and transferred to a weighing dish and weighed.

The strength of commercial formaldehyde, E. F. LADD (*North Dakota Sta. Rpt. 1903, pp. 35, 36*).—An examination of a number of samples of commercial formaldehyde showed that the strength was frequently below the standard of 40 per cent.

The adulteration of drugs, L. F. KEBLER (*U. S. Dept. Agr. Yearbook 1903, pp. 251–258*).—The author cites early instances of the adulteration of drugs, and discusses factors affecting the quality of drugs, importance of purity of drugs, extent and nature of adulteration, and the progress being made in the investigation of drugs and the establishment of standards.

Report of the State chemist of Florida, 1903, R. E. ROSE (*Florida Mo. Bul., Dept. Agr., 13 (1904), No. 89, pp. 71*).—This report deals mainly with the results of fertilizer inspection during 1903, but contains also analyses of miscellaneous substances, foods, waters, ores, etc.

BOTANY.

Report of the botanist, H. L. BOLLEY (*North Dakota Sta. Rpt. 1903, pp. 42–58, fig. 1*).—A report is given of the condition of the department of botany, its equipment and work, particular attention being called to the test of native and other grasses, studies of elevator samples of wheat, the adulteration of formaldehyde and formaldehyde treatment of grains, flax studies, particularly the treatment of flax wilt, and some physiological experiments with trees.

The grass studies, which were begun in cooperation with this Department, were not fully carried out on account of the inability of the station to provide the necessary funds, but the preliminary investigations showed that meadow fescue, rough fescue, western brome, and short-awned brome grasses, under the adverse conditions of the experiment, were of particular value for the State. From the studies made with elevator samples of wheat it is apparent that the average dockage for weed seed, dirt, etc., is considerably higher than the investigation showed necessary. Complaints are mentioned of the failure of the formaldehyde treatment of seed grains for the prevention of smut and this failure is laid to the use of adulterated or weak solutions of formaldehyde.

The experiments for the control of flax wilt have been continued and investigations are in progress by which it is hoped to discover strains of flax immune to the fungus. In connection with these investigations it has been found that the fungus remains in the soil for a longer period than hitherto supposed, and in connection with it is associated an undescribed species of Colletotrichum. This phase of the investigation is to be the subject for a future publication.

The physiological experiments with trees consisted of an attempt to stimulate the tree to growth or to render it less subject to disease through the artificial feeding of the tree by means of liquid solutions injected into the trunks. These investigations have not been carried on sufficiently to establish any positive conclusions, but a number of factors have been determined, among others—under similar conditions a tree seems to feed at about a uniform rate day or night; the rate is influenced by atmospheric temperature, moisture, water supply in the soil, strength of solution applied, etc. Trees vary in their rate of feeding with regard to variety and the natural growth, size, etc. Chemical substances are carried to the utmost parts of trees in a few hours, substances being detected within 10 hours in the topmost

twigs of cottonwood trees 30 to 45 ft. high. The diffusion of liquids radially through the trees is much slower than the vertical movement. The killing effect of solutions appeared to be in direct relation to their strength. The effect of solutions on parasitic disease is inconclusive.

A museum of economic botany, W. G. FREEMAN (*New Phytol., 2 (1903), No. 10, pp. 228-234*).—An account is given of the author's conception of the objects and uses of a museum of economic botany in which he states that "a museum of economic botany should be devoted to illustrating the source, geographical distribution, collection, manufacture, properties and uses of vegetable products, and the conditions controlling their production and utilization, the means employed being specimens, photographs, maps, descriptive information, commercial data, etc.

"The products may be grouped according to (1) their botanical relationships, (2) their uses, (3) their country of origin. In museums devoted to the products of only one country, the employment of the second method appears the most useful. In museums of a wider scope the adoption of the first method has a special interest for the botanist. The second and third methods appear of almost equal value for commercial purposes, the advantage being with the geographical system if the museum is extensively used to illustrate the products and resources of particular countries and the conditions controlling botanical enterprise."

A dictionary of the plant names of the Philippine Islands, E. D. MERRILL (*Philippine Dept. Int., Bureau Govt. Lab. [Pub.], 1903, No. 8, pp. 193*).—The author has compiled a dictionary of the native plant names of the Philippine Islands, the plants being arranged alphabetically by the native names and in a second part alphabetically by their scientific names. The names given are those of 12 or 15 of the more common dialects spoken in the islands.

Philippine agricultural products, F. LAMSON-SCRIBNER (*Ann. Rpt. Philippine Com., 1903, pt. 2, pp. 668-676*).—Alphabetical lists based on the popular and scientific names of the species are given of some of the agricultural products of the Philippines, together with brief descriptions of the plants, their distribution and uses. This information is based upon the author's observations, as well as compiled from the reports of correspondents.

The American element in the Philippine flora, E. D. MERRILL (*Philippine Dept. Int., Bureau Govt. Lab. [Pub.], 1903, No. 6, pp. 19-36*).—A brief review is given of the Philippine flora, in which the author attempts to show the occurrence of American species in the Archipelago. Among the more prominent plants of American origin are a number of economic and ornamental plants which were introduced, principally through Mexico. In addition to these a second group of plants is present most of which are distributed as weeds. These owe their introduction largely to seeds which have been accidentally introduced in packing material.

New or noteworthy plants, E. D. MERRILL (*Philippine Dept. Int., Bureau Govt. Lab. [Pub.], 1903, No. 6, pp. 5-18*).—Descriptions are given of a number of new or noteworthy species of plants many of which are forest trees of considerable importance.

The cultivation of drug plants in the United States, R. H. TRUE (*U. S. Dept. Agr. Yearbook 1903, pp. 337-346, pls. 3*).—Attention is called to the demand for medicinal substances of plant origin, and at the present time the United States is said to be importing many products derived from plants already well established in this country and in some cases occurring as noxious weeds.

A summary is given of crude-drug importations and of drug substances of vegetable origin, from which it appears that during the year 1902 the imports of these two classes of products amounted to a total of $16,041,818.42. Attention is called to a number of common drug plants and suggestions given for their cultivation.

Experiments on the development of the bacteria of leguminous plants in soils independent of the presence of the specific host plant, STEGLICH (*Ber.*

Tät. Landw. Abt., K. Vers. Stat. Pflanzenkult., Dresden, 1903, p. 4).—Experiments with serradella on inoculated and uninoculated soil are reported, which show that root tubercles developed in the uninoculated soil, although the nodules were apparently larger and more numerous in the inoculated soil and the yield was also somewhat larger.

Experiments on the effect of copper sulphate in the soil on plant growth, Steglich (*Ber. Tät. Landw. Abt., K. Vers. Stat. Pflanzenkult., Dresden, 1903, p. 4*).—Copper sulphate was applied to soils in pots two years in succession, at rates of 40, 80, and 160 gm. per square meter of surface, without injurious effects on fruit trees and strawberries. Injury resulted, however, when like amounts were applied in the field to potatoes, beans, etc.

Two types of intramolecular respiration of higher plants, A. I. Nabokikh (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 6, pp. 696–713*).—The experiments of the author lead him to distinguish two types of intramolecular respiration of higher plants, i. e., typical alcoholic fermentation, and alcoholic fermentation of glucose with the decomposition of organic acids. The typical alcoholic fermentation is shown in experiments with glucose, experiments of long duration in water, and, probably, the cultures in mannite of long duration.

In these series of cultures the ratio between carbon dioxid and alcohol was observed to closely correspond to that of alcoholic fermentation. In the combination of alcoholic fermentation of glucose with the decomposition of organic acids, the most striking examples were observed in experiments with weak solutions of lactic acid. It was found that during the entire time of the experiment a comparatively large quantity of acid was lost, while at the same time the amount of alcohol was found to be 12 to 35° lower than is characteristic for the alcoholic fermentation.

A series of parallel experiments in water and peptone showed that the latter, like glucose, is capable of considerably increasing the energy of the intramolecular respiration of peas. The alcoholic coefficient is here close to the normal for alcoholic fermentation, averaging 102 instead of 104.5. The author thinks, however, that peptone acts on the fermentation indirectly increasing the activity of the ferments which convert starch into sugar and decompose sugar into alcohol and carbon dioxid.

The experiments in a 1 per cent solution of asparagin gave correspondingly low values for the alcoholic coefficient, 95.1 in the mean.

In 2 series of experiments in solutions of saltpetre, one lasting 7 days and the other 14 days, it was found that in those of shorter duration the yield of alcohol was so high that it was impossible to suppose that any appreciable amount of alcohol was oxidized by the oxygen set free in the process of reduction of the saltpetre by the seed. In the longer experiments the alcohol decreased in amount and nitrogen was set free, corroborating the views of Stoklasa and others.

The experiments referred to were all made with peas (*Pisum sativum*). The intramolecular respiration of castor beans was found to be very weak for all the solutions tested.—P. FIREMAN.

On the nature of the middle lamella, H. Devaux (*Mem. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 3* (*1903*), *pp. 89–120*).—After reviewing some of the numerous opinions regarding the constitution of the middle lamella occurring in plants, an account is given of micro-chemical studies of a considerable number of species of plants representing widely separated genera and families. The methods of examination and technique of the specimens are described at length.

The author concludes that from the reactions observed the middle lamella in the softer tissues of plants is not composed of pectate of lime but of pectose, and, contrary to the opinion of many chemists, pectose, at least that occurring in the middle lamella, is readily attacked by either hot or cold, dilute or strong, alcoholic or aqueous acids. In this action an intermediate body between pectin and pectose is formed.

A preliminary note on the action of the radiations from radium bromid on some organisms, H. H. Dixon and J. T. Wigham (*Sci. Proc. Roy. Dublin Soc., n. ser., 10 (1904), II, No. 19, pp. 178-192, pls. 3*).—A report is given of the behavior of seedlings of *Lepidium sativum*, specimens of *Volvox globator*, and a number of bacteria toward radium bromid. Experiments were planned to find out whether the radiations would act as a stimulus to growth curvatures, or if they would exert a directive action on the growth of the motile organism. At the same time abnormal and pathological effects were looked for.

One hundred seeds of *L. sativum* were evenly distributed over a surface of moist quartz sand, and after germination had taken place a glass tube containing 5 mg. of radium bromid was set over the central seed at a distance of 1 cm. from it. At the end of a few days the seedlings had grown up around the tube, but no curvatures were apparent. The seedlings within 1 cm. radius were slightly smaller than the others, but the difference was not very pronounced, nor did the plants appear in any way abnormal. At the end of 10 days the difference in height was more noticeable, and when the radium tube was removed and the seedlings exposed to daylight the central plants remained behind the others in point of growth for several days, during which they were kept under observation.

In a second experiment seeds similarly treated showed, 3 days after germination, a slight retardation of growth. At this time it was noticed that the number of root hairs of the retarded seedlings was considerably inferior to that of the others, but otherwise the retarded individuals seemed healthy.

A third lot of seedlings were tested in which dry seeds were distributed over moist sand and the radium tube supported at a distance of 0.5 cm. from the seed and the germination observed. As before, a slight retardation was noted, but no injury could be discovered.

Experiments conducted with Volvox showed that after 24 hours no special arrangement of the colonies could be observed, and they were neither attracted nor repelled by the radium tube.

In the case of the experiments with the bacteria the organisms were found to be inhibited in their development and in some cases were perhaps killed. To determine whether the organisms were actually killed or merely arrested in their development, inoculations were made from the apparently sterile patches and in almost every case the development showed that the organisms were not killed, but the action was only inhibitory. It is probable that the radiations caused a change in the medium which was responsible for the failure of development of the organisms.

ZOOLOGY.

The economic value of the bobwhite, S. D. Judd (*U. S. Dept. Agr. Yearbook 1903, pp. 193-204, pl. 1*).—Notes are given on the distribution, habits, and economic importance of this bird. The quail is considered as of importance in destroying weed seeds and insects and in furnishing food and sport.

A study was made of 801 stomach contents of quails, collected every month of the year in 21 States, Canada, and the District of Columbia. An examination of the food showed that 14.93 per cent was animal matter and 85.07 vegetable. Seeds form 50.78 per cent of the food for the year. The majority of this seed is from weeds of which 60 species are represented. The author estimates that in the State of Virginia quails destroy 573 tons of weed seeds annually. Grain forms only about $\frac{1}{4}$ of the food, while large numbers of potato beetles, cucumber beetles, chinch bugs, and other injurious insects are eaten.

Brief notes are given on the means of protecting this bird, and a detailed list is presented of the seeds, fruits, insects, etc., eaten by the quail.

Importation of game birds and eggs for propagation, T. S. Palmer and H. Oldys (*U. S. Dept. Agr., Farmers' Bul. 197, pp. 30, fig. 1*).—Since the passage of

the Lacey Act, more than 23,000 birds have been imported into the United States, of which the most important are quail, pheasants, partridges, ducks, and geese. About 2,000 eggs have been imported since the passage of the Egg Act in June, 1902. A brief account is presented of the nature of these importations, with notes on the countries from which birds are imported and on the success of the importations.

Some new facts about the migration of birds, W. W. Cooke (*U. S. Dept. Agr. Yearbook 1903, pp. 371–386, figs. 2*).—A general discussion of the causes of migration, the means by which birds find their way during migratory flights, the distance and routes of migration, casualties during migration, relation of migration to temperature, and variations in the speed of flight. While many casualties may occur during the flight of birds over long stretches of water, observations show that as a rule long flights are made with apparent ease and that the birds do not alight immediately upon reaching the shore.

Causes of the diminution in the number of useful birds, A. Truelle (*Jour. Agr. Prat., n. ser., 7 (1904), No. 23, pp. 742–744*).—A brief discussion is given of the influence of climatic changes, the operations of bird hunters and other agencies upon the number of birds.

Birds in relation to agriculture, Gunning (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 335–338, pls. 5*).—Notes on the feeding habits and economic relations of various species of herons and storks.

Rabbit destruction (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 5, pp. 392–396*).—Various kinds of poison baits are described, such as phosphorized oats or wheat, apples and strychnin, grain and arsenic, etc. Methods of applying the baits are also described.

Trapping rabbits inside fences, T. Potter (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 11, pp. 621, 622, figs. 2*).—A description is given of a method of using wire fences around enclosures so as to entrap rabbits.

Destruction of rats, G. Gándara (*Com. Parasit. Agr. [Mexico], Circ. 7, pp. 19, figs. 28*).—The direct injuries caused by rats and their agency in transmitting infectious diseases are discussed. The author mentions various natural enemies of rats and artificial means of repression, such as poisons, traps, etc.

Usefulness of the American toad, A. H. Kirkland (*U. S. Dept. Agr., Farmers' Bul. 196, pp. 16*).—This bulletin is essentially a condensed form of the material published in Massachusetts Hatch Station Bulletin No. 46, and previously noted from that source (E. S. R., 9, pp. 330–332).

The economic value of Pennsylvania animals in relation to agriculture, shown in the agricultural exhibit of Pennsylvania at the St. Louis Exposition, H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 1, pp. 32, pls. 14*).—A detailed description is given of the Pennsylvania exhibit in economic zoology at the World's Fair.

Results of the Swedish zoological expedition to Egypt and the White Nile, 1901, I, L. A. Jägerskiöld (*Upsal, Sweden: K. W. Appelberg, 1904, pp. 250, pls. 9, figs. 12*).—This report contains articles on White Ants in the Sudan, by I. Trägårdh; *Scaphanocephalus expansus*, by L. A. Jägerskiöld; Water Beetles, by D. Sharp; Lepidoptera, by C. Aurivillius; Ants in Egypt, by G. Mayr; Termitophilous Insects, by E. Wasmann; Birds from the White Nile, by L. A. Jägerskiöld, etc.

Destruction of vermin (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 46, 47*).—Notes on fencing, poisoning, and other methods of preventing losses to stock from jackals.

METEOROLOGY—CLIMATOLOGY.

Weather Bureau stations and their duties, J. Kenealy (*U. S. Dept. Agr. Yearbook 1903, pp. 109–120, figs. 2*).—This article briefly reviews the origin and development of the meteorological service, describes the general features of the equipment and organization of Weather Bureau stations, and explains the nature of the daily duties

of observers at these stations. The flags, pennants, and signals used by the Weather Bureau in forecasting the weather and temperature are described and their use explained.

Use of Weather Bureau records in court, H. J. Cox (*U. S. Dept. Agr. Yearbook 1903, pp. 303–312*).—The extent to which Weather Bureau records are used in court and their value as evidence are discussed.

Meteorological observations, J. E. Ostrander, F. F. Henshaw, and G. H. Patch (*Massachusetts Sta. Met. Buls. 184, 185, 186, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during April, May, and June, 1904. The data are briefly discussed in general notes on the weather of each month.

Precipitation for twenty-nine years at Dodge City, Kans., E. D. Emigh (*Mo. Weather Rev., 32 (1904), No. 3, pp. 115, 116*).—All available data for the period are compiled. These do not show any increase in the rainfall of western Kansas during the period.

Summaries of temperatures, rainfalls, and sunshines, E. F. Ladd (*North Dakota Sta. Rpt. 1903, pp. 16–20*).—Summaries are given of monthly and annual precipitation at Fargo during 1903 and 8 preceding years; on sunshine during 1903 and 4 preceding years; and evaporation from a water surface during May to September, 1903.

The mean temperature during 1903 was 37.7°, the maximum 97° in June, the minimum —38° in February. The total rainfall was 23.81 in., which is 2.93 in. above the average for the past 12 years. The percentage of sunshine was 41.18, having steadily decreased from 48.8 per cent in 1899. "The total amount of water evaporated from a water surface for the 5 months May to September, inclusive, was 41.87 in., or an average of 8.37 in. per month, or a daily average of 0.263 in."

Meteorological conditions in Norway, 1902 (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1902, pp. 659–679*).—A summary of the average temperature of the air and the precipitation for each month of the year, for the various weather stations of Norway.—F. W. WOLL.

Relation of precipitation to yield of corn, J. W. Smith (*U. S. Dept. Agr. Yearbook 1903, pp. 215–224, charts 8*).—This article is mainly a series of charts showing the close relation which exists between precipitation and yield of corn per acre during a series of years in the region covered by Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas, Missouri, and Kentucky.

A method of avoiding the danger of night frosts by application of frost torches, S. Lemström (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 6, pp. 420–428; trans. from Mitt. Ver. Förd. Moorkultur, 1903, No. 15–16*).

WATER—SOILS.

[Analyses of water], P. Carmody (*Ann. Rpt. Govt. Analyst [Trinidad], 1903–4, pp. 8–10*).—Tabulated analyses are reported of samples of the Port-of-Spain and San Fernando water supplies taken at different dates, of miscellaneous samples of water, and of rain waters, the latter showing monthly averages during 1903 of chlorin, total ammonia, and nitrogen as nitrates.

Methods used for controlling and reclaiming sand dunes, A. S. Hitchcock (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 57, pp. 36, pls. 9, figs. 9*).—This bulletin discusses the formation of sand dunes and methods of fixing the shifting sands, and gives the results of a personal study of the methods of control employed in the Netherlands, Denmark, Germany, and France. The methods now in successful use on a large scale are of three classes:

"(1) Transplanting sand-binding plants upon the dunes, sufficiently thick to form a living cover; (2) covering the entire surface with some inert material which pre-

vents the wind from reaching the sand, and (3) covering the surface with a network of brush fence which, while not preventing the wind from reaching the sand, lessens its velocity and prevents drifting. . . .

"The sand is first held in place by some inert covering or a plantation of grass, and afterwards a forest is established by transplanting young trees.

"Trees will not grow in the immediate vicinity of the ocean; hence a narrow strip along the coast must be permanently held in place by means of a sand-binding grass.

"The best grass for this purpose is beach grass (*Ammophila arenaria*), which grows naturally along the sandy seashores of the North Atlantic coast. The same species grows along the shores of the Great Lakes and on the Atlantic coast of the United States as far south as North Carolina.

"The grass is transplanted in rows or squares in autumn or spring. Satisfactory results can not be produced by sowing the seed of this or of other plants directly upon the unprotected sand.

"Where heather grows in sufficient abundance this is cut and laid upon the surface of the sand.

"The third important method for preventing drifting is the use of sand fences. These consist of rows of rough stakes or pieces of brush driven into the sand and projecting above the surface from 1 to 3 feet. For holding the sand the shorter stakes are placed in squares of 9 to 12 feet, forming a network. For accumulating sand in hollows or repairing breaches in a protecting dune the high fences may be used. Solid fences are not used.

"The drifting of the sand having been prevented by one of the above methods, young trees are set out to form the permanent covering of forest. In northern Europe no satisfactory results have been obtained in establishing a forest by sowing the seed, but in southwestern France a forest was produced by sowing the seed of *Pinus maritima* upon the sand and covering it with brush.

"The trees used are: In the Netherlands, *Pinus austriaca* and *P. laricio* near the coast, *P. sylvestris* on the interior dunes; Denmark, *Pinus montana* near the coast and *Picea excelsa* (preceded by *Pinus montana*) on interior heath land; Germany, *Pinus montana*; France, *Pinus maritima*."

Drift-sand reclamation work, T. R. Sim (*Natal. Agr. Jour. and Min. Rec., 7 (1904), No. 3, pp. 259–264, figs. 3*).—An account is given of the reclamation work being carried on at Durban for the prevention of the drifting of sand along the beach.

Soil studies, E. F. Ladd and H. M'Guigan (*North Dakota Sta. Rpt. 1903, pp. 23–33*).—The results of studies of the composition and properties of humus from different sources are reported, showing "that when fractional precipitation is employed with humus extracts very different results are had with varying conditions of soils. In some cases all of the humus is precipitated in the first fractional, and in other cases all may come down in the last fractional, and in other cases about the same amount will be had for each precipitation. It has been found, however, that these several precipitates have very different values and widely varying compositions. This problem is now being further investigated, and it is believed results can be had which will throw much light upon some of the problems not well understood."

Some results of investigations in soil management, F. H. King (*U. S. Dept. Agr. Yearbook 1903, pp. 159–174*).—This article discusses advantages of thorough cultivation in the South, loss of water by evaporation from southern soils, cultivation to make water-soluble plant food available, faulty methods of cultivation, need of greater porosity and better granulation for soils of South Atlantic and Gulf coastal plains and of more frequent and deeper plowing, importance of the granular structure in soils and the conditions which favor its development and maintenance, need of increasing the organic matter in southern soils, relative rates of nitrification in

some southern soils, and influence of lime and stable manure on nitrification and water-soluble phosphates and sulphates.

Frequent and thorough cultivation to conserve soil moisture and render plant food available is shown to be of great importance, especially in soils of close structure and feeble granulation, such as are found in many parts of the South. Objections to the common practice of running the plow close to the rows of corn and throwing the earth away from the plants are pointed out, and the advantages of flat cultivation for corn, potatoes, and cotton are explained. More frequent and deeper plowing is recommended as a means of improving the mechanical condition of the soils.

Some soil problems for practical farmers, E. C. CHILCOTT (*U. S. Dept. Agr. Yearbook 1903, pp. 441–452*).—The lack of proper instruction in schools and colleges regarding the origin and properties of soils is pointed out, and suggestions are made regarding home study of physical geography and geology by farmers as preliminary preparation for the practical study of soil problems.

The article also discusses the essentials of a progressive farmer, requisites for the successful teacher or investigator, the relation of the scientist to the farmer, and methods and value of crop rotations, the discussion of the last topic being based upon the results of experiments carried on at the South Dakota Station during the last 7 years. "Crop rotation is only one of the many soil problems that should be worked out in the field at the experiment stations and by farmers upon their own farms; and the farmer and the scientist should keep in close touch, so that each may profit by the experience of the other."

"Sour" or acid soils and their treatment, H. G. FOURCADE (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 33–43*).—A general discussion of the character of decomposition which organic matter undergoes in the soil, the conditions which affect soil acidity, methods of treatment of acid soils, and crops adapted to such soils. Numerous references to the literature of the subject are given.

The relation of humus to plant growth, V. H. DAVIS (*Jour. Columbus Hort. Soc., 19 (1904), No. 2, pp. 55–60*).—A general discussion of this subject.

Factors of availability of plant food, G. S. FRAPS (*Amer. Chem. Jour., 32 (1904), No. 1, pp. 1–13*).—This is the full text of the paper, an abstract of which has already been noted (E. S. R., 15, p. 858).

FERTILIZERS.

Experiments with nitrogenous fertilizers, H. J. PATTERSON (*Maryland Sta. Bul. 91, pp. 25–53*).—This bulletin discusses the early use of nitrogenous fertilizers, the importance of nitrogen as a plant food, loss of nitrogen from the soil, general conditions indicating the need of nitrogen, quantity of nitrogen annually removed from Maryland farms, the origin and supply of nitrogen in soils, condition of the nitrogen of soils, nitrification, sources of nitrogen, the use of the free nitrogen of the atmosphere by plants, and artificial inoculation, and gives a summary of results of experiments begun in 1897 on medium-stiff clay loam. The object of these was to compare different times of applying nitrate of soda (just before planting with and without lime, at period of most active growth, and one-half before planting and one-half at time of most active growth), to test the comparative effects of nitrate of soda and sulphate of ammonia and of lime applied with mineral sources of nitrogen, to compare nitrate of soda combined with sulphate of potash with nitrate of potash, to compare different sources of organic nitrogen (including dried blood, raw and dissolved leather waste, raw and dissolved hair waste, bone tankage, dried fish, cotton-seed meal, and stable manure), and to test the effect of treating hair and leather waste with acid. The materials were applied in amounts supplying 32 lbs. of nitrogen per acre. The crops for which data are given are corn, wheat, and hay.

The results in general favor the application of nitrate of soda before planting rather

than after the crop is partially grown, and indicate that a top-dressing of this substance pays well as a rule on wheat which for any cause (either poor land or from late seeding) is backward in the spring, although its use is of doubtful benefit on land which is well supplied with plant food. Nitrate of soda gave uniformly and decidedly better results than sulphate of ammonia, both with and without lime. Nitrate of potash gave better results than nitrate of soda combined with a potash salt (sulphate), but the advantage was not great enough "to warrant the difference in cost which usually prevails." The organic sources of nitrogen were not as active as nitrate of soda. Of the three principal forms tested blood stood first as regards effectiveness, leather second, and hair last. The results seem to show decided advantage from treating leather with acid, but little or no advantage from so treating hair. Fish gave better results than bone tankage and stable manure than cotton-seed meal.

Brief accounts are given of miscellaneous experiments with vegetables and in top-dressing grass land and lawns. As a result of 2 years' experiments the conclusion is reached "that either bone or fish tankage is the most desirable material for top-dressing lawns, and for the city or town lawn is much easier to get, cheaper, and more agreeable to use than stable manure."

Experiments on supplying the nitrogen requirements of plants from the atmosphere, Steglich (*Ber. Tät. Landw. Abt., K. Vers. Stat. Pflanzenkult., Dresden, 1903, pp. 2, 3*).—This is a brief report of progress in experiments begun in 1900 to determine whether under systems of fallow or green manuring it is possible to derive sufficient nitrogen from the air to maintain normal yields. The principal data obtained in experiments on loam and sandy soils in vegetation pots are tabulated, but no conclusions are drawn.

On the preservation of liquid manure, J. Sebelien and E. Forfang (*Norsk Landmandsblad, 23 (1904), No. 11, pp. 135, 136*).—In laboratory trials with peat litter, or peat litter and sulphuric acid, as preservatives of liquid manure, 30 gm. of peat or 5 cc. of sulphuric acid per 200 cc. of liquid manure prevented any loss of nitrogen during a period of 1½ months, while a loss of 54 per cent occurred when no preservatives had been added. In another series of trials 25 gm. of peat litter per 300 cc. reduced the loss of nitrogen during 125 days from nearly 60 per cent to 5 per cent, there being practically no loss when peat was added in the proportion of 25 gm. to 100 cc. or to 200 cc. of liquid manure.—F. W. WOLL.

On the fineness of slaked lime, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 320–322*).—Trials conducted at Flahult experiment station showed that water-slaking is superior to self-slaking in open air, although even the latter method was found to give lime of considerable fineness, viz, from 52 to 75 per cent of "fine-meal" (finer than 0.2 mm.).—F. W. WOLL.

Pot experiments with superphosphate, Thomas slag, bone meal, and phosphorite, A. Rindell (*Landtbr. Styr. Meddel., 1903, No. 44, pp. 19–28*).—The results obtained by the author indicate that superphosphate has a higher value as a phosphoric-acid fertilizer than either Thomas phosphate or bone meal, and that the latter fertilizers have a similar effect; that bone meal, therefore, is a more valuable fertilizer in comparison with Thomas phosphate than is indicated by the results of German experiments.—F. W. WOLL.

Cooperative field experiments with Thomas slag and kainit, A. Rindell (*Landtbr. Styr. Meddel., 1903, No. 44, pp. 1–19*).—This is a compilation of the results of experiments conducted by the author at different Finnish farms. Summary statements of the data obtained are given, with a brief discussion of the results.—F. W. WOLL.

Experiments with commercial fertilizers, E. F. Ladd (*North Dakota Sta. Rpt. 1903, pp. 20–23*).—The results of cooperative experiments with fertilizers on wheat in different parts of the State are briefly reported. In these experiments there was

apparently no marked advantage from the use of fertilizers, although in parallel experiments carried on at the station there was a decided benefit both as regards yield and quality of product from the use of fertilizers.

On calcium cyanamid, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 18 (1904), No. 1, pp. 54–56*).—A historical sketch of the efforts made to utilize the nitrogen of the air for fertilizing purposes, with description of the new fertilizer, calcium cyanamid.—F. W. WOLL.

Fertilizers, R. E. Rose and E. E. McLin (*Florida Mo. Bul., Dept Agr., 14 (1904), Nos. 1, pp. 25–46; 2, pp. 27–50; 3, pp. 27–46; 4, pp. 27–50*).—These bulletins give the results of fertilizer inspection under State law, with notes on use of fertilizers, formulas for special crops, and miscellaneous information.

Commercial fertilizers (*Quart. Rpt. Kansas State Bd. Agr., 23 (1904), No. 90, pp. 14*).—A brief report is given of work done under provisions of the State law enacted in 1903, the text of which is given, with a discussion of the relation of the Kansas farmer to commercial fertilizers.

Fertilizers, B. W. Kilgore (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 4, pp. 39*).—This includes analyses of fertilizers inspected during the spring of 1904 and of samples of cotton-seed meal, with a list of brands of fertilizers registered in North Carolina for 1904, explanations of terms, notes on valuation, etc.

Law regulating the sale of commercial fertilizers, E. F. Ladd (*North Dakota Sta. Rpt. 1903, pp. 13–15*).—The text of the State law regulating the sale and analysis of fertilizers, approved March 19, 1903, is given. The law applies to all fertilizers the selling price of which exceeds $5 per ton and requires a license fee of $20 for each and every brand of fertilizer carrying a distinctive name, brand, or trade-mark, and a statement on each package showing percentages of phosphoric acid soluble in water, reverted, insoluble, and total; nitrogen in nitrates, as ammonia, and total; potash soluble in water, and chlorin. The sale of leather or its products or other inert nitrogenous material in any form is prohibited without an explicit printed statement regarding the nature of the material. The enforcement of the law is intrusted to the director of the North Dakota Agricultural Experiment Station.

Analyses of commercial fertilizers, M. B. Hardin (*South Carolina Sta. Bul. 87, pp. 18*).—This bulletin reports analyses of 171 samples of fertilizers collected during the season of 1903–4, and briefly discusses the composition and valuation of commercial fertilizers.

Commercial fertilizers, M. B. Hardin (*South Carolina Sta. Bul. 85, pp. 9*).—A summary is given of the results of analyses of 340 samples of commercial fertilizers examined during 1902 and 1903, with a comparison of the results with those of previous years, as well as remarks on cotton-seed meal.

On the economic application of sawdust, G. A. Sellergren (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 4, pp. 301–309*).

Covered drying frames for peat litter, H. V. Tiberg (*Svenska Mosskulturför. Tidskr., 17 (1903), No. 5, pp. 324–328, figs. 3*).

FIELD CROPS.

Annual report of the Alaska Agricultural Experiment Stations for 1903, C. C. Georgeson (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 313–389, pls. 9*).—In connection with the progress reported for 1903 the organization and previous work of the stations is reviewed, the outlook for the future discussed, and plans for scientific investigation outlined.

Work at Sitka Station.—The vegetables tested were grown on soil cultivated for 3 years and not yet comparable with an average good garden soil. Broad Windsor bean planted May 21 produced a large number of pods ready for use by September 1. Four varieties of beets, Extra Early Egyptian, Golden Tankard, Mammoth Food,

and Eckendorfer, made a rapid growth through the latter part of the season, but on account of the soil being too wet all were small. Improved Half Dwarf Brussels sprouts started in the hot bed April 20 and set out June 6 and 9 showed much variation among individuals, but some plants gave very satisfactory results.

Of seven varieties of cabbage, Early Winningstadt, Early Summer, Extra Early Express, Late Drumhead, and Danish Ball Head, started in the hot bed April 20, produced good heads. Chantenay Half Long carrot and Giant Pascal, Improved White Plume and Golden Self-Blanching celery gave promising results. Dwarf Green Curled Scotch kale gave equally good yields whether sown in the open ground May 21 or started in the hot bed April 20 and set out June 9. Scotch kale is considered one of the reliable garden crops for Alaska. Trondhjemsk kohl-rabi proved adapted to the region and Extra Curled parsley yielded excellent leaves.

All varieties of lettuce seem to do well in Alaska, but no one variety can be recommended for the whole Territory. San Francisco market has so far given the best results of all the varieties tested. Of the varieties of peas grown, Earliest of All, or Alaska, is recommended for general planting. Yakima potatoes planted on old ground May 6 to 8 and dug October 9 to 13 yielded at the rate of nearly 300 bu. per acre. Rhubarb, ruta-bagas, sage, and turnips grew well.

A nursery has been started at the station and notes on the growth of apple, cherry, and plum trees, and raspberries, currants, strawberries, and cranberries are given.

The results with field crops and forage plants are briefly presented. Lapland barley sown May 29 was harvested September 25 and Success sown the same date was harvested September 21. Sisolsk sown on May 23 and Manshury May 28 were harvested September 19 and September 10, respectively. Sixty-Day oats has been found early enough to mature, but it lodges badly. Burt Extra Early which stood next in earliness produces a stronger straw and a heavier grain. Swedish Select oats has given good results for 2 seasons. Improved Ligowo and Nameless Beauty are good varieties for hay and silage. Romanow Spring wheat sown May 7 was harvested September 19. This is the best variety of spring wheat tested at the station. Giant French Winter rye withstood the winter and yielded grain of fair quality. Riga fiber flax sown June 4 was ripe for pulling October 3, but its quality was injured by lodging. Russian buckwheat made a good growth and was harvested September 12.

Among the different grasses tested, Tall Meadow Oat grass is the most promising. Timothy did not seem as valuable as either Tall Meadow Oat grass or orchard grass. In addition to the grasses mentioned, Perennial Rye grass, Red Top, Kentucky blue grass, and Meadow foxtail were tested. None of the grasses suffered from winter killing and all matured seed.

Work at Copper Center Station.—The general conditions of the region are described and the results with field and garden crops briefly noted. Although frost occurred in every month of the year, Manshury, Lapland, Sisolsk, Royal, Trooper, No. 6175, Black Hulless, and No. 9133 barley, and Nameless Beauty, Burt Extra Early, Sixty Day, Finnish Black, No. 2800, and Swedish Select oats matured. Hardy garden vegetables as well as grasses and clover sown in the spring grew well. Spring wheat, emmer, buckwheat, and peas were killed by frost August 27 before they were ripe. Flax sown broadcast May 20 stood 30 inches high August 10 and produced the first ripe seed August 25, but only a small per cent of the seed had ripened by September 10. Good stands were secured with timothy, orchard grass, tall meadow-oat grass, tall meadow fescue, smooth brome grass, and perennial rye grass.

Most of the common, hardy vegetables were tested. Little Gem and Earliest of All peas planted May 14 were ready for table use 88 and 65 days from planting, respectively. Big Boston and Early Curled Silicia lettuce were of excellent quality and made a thrifty growth. Extra Early Red onions did not grow very large, but were fit for table use. Promising results are also recorded for radishes, carrots, turnips, ruta-bagas, parsnips, beets, beans, kale, and cress.

Work at Kenai Station.—The general improvements and conditions at the station and the station work are mentioned and the results of different culture tests are noted. Vegetables in general, with the exception of cabbage, celery, and parsley, did not grow well this season. Early Rose and Early Burbank potatoes were planted May 23 and harvested September 24, and of the yields produced ⅜ and ½, respectively, were marketable. Giant Winter rye was sown August 25, 1902, and harvested September 21, 1903. The straw ripened, but the grain was not matured enough to grow. Excelsior Winter rye gave the same results. Romanow Spring wheat, Manshury barley, Sixty Day, Swedish Select, and common oats, and Orenburg buckwheat did not mature. The straw of the wheat and of Swedish Select oats was harvested for hay.

Of the grasses sown in the spring of 1902, Lolium perenne and Avena elatior were winterkilled. Alopecurus pratensis grew 30 in. high and was mowed for hay July 6 and had produced a second crop, although smaller than the first by September 10. Bromus inermis made a good stand and grew 16 in. high. The following grasses and forage plants sown June 1, 1903, also produced good stands: *Dactylis glomerata*, *Avena elatior*, White clover, Red clover, Alsike clover, *Phleum pratense*, *Lolium perenne*, *Agrostis vulgaris*, and Rape. Hemp was a failure.

Work at Rampart Station.—The following grains again matured this year: Flying Scotchman, Black Finnish, Burt Extra Early and common oats, Manshury barley, and Romanow Spring wheat. The Black Finnish oats stood 5 ft. high and yielded a good grain. Manshury barley was also good, while the grain of the others was inferior.

Cooperative experiments on Wood Island.—Beardless and Manshury barley and flax matured and the results with oats were also quite favorable. A mixture of oats and White Canadian and Blue Prussian peas yielded about 8 tons of green forage per acre. Excelsior, Giant, and Schlanstedt rye grew 5 ft. high, but produced empty heads. Spelt and spring wheat gave some promise of ripening. Timothy sown 2 years ago is reported as being 3 ft. high and having long full heads. A half acre of *Bromus inermis*, sown the year before, produced about half a ton of hay. White clover sown with timothy made a good showing. Of the vegetables tested, lettuce, parsley, potatoes, and radishes have given encouraging results. The growth of flowers and trees is also briefly noted. A milk record of 5 cows for August, 1903, shows a total milk production of 2,649.5 lbs. A total yield of 2,610 eggs was obtained from 26 hens and 9 ducks during 6 months beginning with March.

A series of reports from seed distribution to parties throughout the Territory is presented, and soil temperatures taken at the Sitka, Copper Center, and Kenai stations, together with meteorological observations for 1902 and 1903 at 19 different points, are recorded in tables.

Annual report of the Hawaii Agricultural Experiment Station for 1903, J. G. Smith (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 391–418, pls. 4*).—This report, after briefly noting the construction of buildings during the year, together with the additions to the station equipment, discusses at greater length the experiments with different crops. The publications of the station are briefly listed, and work at farmers' institutes and in the outlying islands is noted. A report on the funds of the station is also given.

Experiments in corn culture are carried on in the Kula district to determine the effect of deeper plowing and improved methods of cultivation. Land is usually plowed from 1 to 3 in. deep, but the experiment field was plowed from 6 in. to 1 ft. deep and planted with a number of the best varieties of corn from the Middle West and from the New England States. Leaming and Boone County White give indications of being well adapted to the Kula district. Corn planted in deep furrows in plowed land made a better growth than that which had been planted in surface rows.

The quick rot of potatoes was largely reduced by soaking the seed in a 3 per cent

formalin solution from 20 to 30 minutes before planting, and spraying the furrows with this same solution after planting.

Observations on the taro root-rot disease were continued this year (E. S. R., 15, p. 133). The treated plat, which produced taro almost entirely free from disease the year before, was again planted to this crop without further treatment, and the plants obtained appeared healthier than those on untreated plats near by. A variety test with tomatoes was begun, but is as yet incomplete. Many of the varieties produced a rank growth of vine without setting fruit. An analysis of the soil on which the tomatoes were grown showed that it contained 0.58 per cent of potash, 1 per cent of lime, 4.55 per cent of magnesium, 0.75 per cent of phosphoric acid, and 0.38 per cent of nitrogen.

The forage conditions of Hawaii are described and the dairy industry is briefly reviewed. In general the grasses are few on the ranges, being largely confined to Bermuda grass from the coast to an elevation of 4,000 ft., and to hilo grass (*Paspalum conjugatum*) above that altitude. One of the native grasses, *Heteropogon contortus*, once abundant on the leeward coasts to about 1,000 ft. altitude, has been practically destroyed by overstocking. Culture tests with alfalfa have shown that this crop grows well up to an altitude of about 3,000 ft. and that it can be grown without irrigation at the higher elevations where the rainfall is more abundant.

The extent to which Hawaiian cattle are infected with the liver fluke is pointed out. It is reported that 990 cattle out of 3,376 slaughtered for the Honolulu market during the last 6 months of 1902 were infected with liver fluke, and that 247 out of 487 calves examined during that period also showed infection. The life history of the liver fluke is given and the symptoms it produces in infected cattle described. Infection with this internal parasite is much worse in the windward districts and upper mountain pastures than in the drier portions of the islands.

The culture of tobacco, vanilla, sisal, peppers, castor beans, pineapples, cotton, sugar cane, and coffee in the islands is discussed, and lines of experimental work suggested. A successful experiment in curing and fermenting vanilla pods for the production of commercial vanilla was made at the station in 1903, and as the vanilla bean grows well throughout the islands the production of vanilla on an extended scale is considered feasible. Several of the best varieties of cotton have been grown at the station, and individual cotton plants known to be 15 to 20 years old are reported as existing in the islands.

The entomological work done in the islands is reviewed and the necessity for investigations along certain lines pointed out. The principal insect enemies mentioned are the cane borer (*Sphenophorus obscurus*); the leaf hopper (*Perkinsiella saccharicida*), a recent pest in sugar-cane plantations; the so-called "melon fly;" plant lice, threatening the corn crop of the Kula district; cutworms; a scale insect (*Mytilaspis pinnæformis*) on citrus trees; the Japanese "rose" beetle (*Adoretus umbrosis*) and the "Olinda bug" (*Aramigus fulleri*), destructive to fruits and trees; the peach scale (*Diaspis amygdali*); and the "torpedo fly" (*Siphanta acuta*), injurious to the mango. Besides the common mosquito, the Cuban yellow-fever species (*Stegomyia fasciata* and *S. scutellaris*) are reported as occurring in the islands.

Annual report of the Porto Rico Agricultural Experiment Station for 1903, F. D. Gardner (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 419–468, pls. 6*).—Progress in the improvement and equipment of the station, together with the results of experimental work, is reported. The scope of the investigations is outlined and the rainfall for 1899 to 1903, inclusive, at 4 different points in the island is recorded.

Of different leguminous crops tested at the station, velvet beans have given the best results. Alfalfa, cowpeas, soy beans, and beggar weed have not so far produced a satisfactory growth The sword bean made a good growth, but it grew slower and for a much longer period than the velvet bean.

The results with grasses and forage plants indicated that Bermuda grass is a better lawn grass under the prevailing conditions than gramma grass. Teosinte and Johnson grass gave promise of good growth for forage purposes. Corn was destroyed by bud worms, which feed on the newly formed leaves in the terminal bud. Native flint corn seemed more resistant than yellow dent, while sweet corn failed entirely. Kafir corn, sorghum, and broom corn proved more resistant than corn. Of many kinds of vegetables from northern-grown seed, only cabbages, carrots, cucumbers, lettuce, and radishes were in a measure successful.

Report of the entomologist and botanist, O. W. Barrett (pp. 429–450).—The collections of economic plants which have been assembled by the station are enumerated and briefly noted. A banana plat of about 3 acres was established, and in planting it was observed that the "ñame," or short portion of the stem base with a corm-like rootstock, was preferable for dry soil; that the "tallo," or 3-ft. section of stem with root, gave best results in wet soil; and that the "pichón," or 2 to 3 ft. sucker or offshoot from the stem base, was most convenient for general purposes. Each of these methods after 8 months had produced about the same number of offshoots. Drying the roots in the sun for several days was found to injure the vitality of the plant and considerably retarded its sprouting. The plants growing in a heavy, red, moist clay with apparently little humus have thus far made the best growth. The varieties of Yautia, yams, miscellaneous native and imported crops, bulbs and fiber plants, cassava, rubber, and cacao, which form part of the collection, are listed and briefly discussed. A forest plat of native and introduced species has been established, and a list of the species set out is given. Propagation experiments with native fruits have been begun and the various species tested in this connection are mentioned.

The discussion of the entomological work for the year consists largely of notes on the various insect pests, including cutworms, coffee insects, insect enemies of citrus stock and miscellaneous fruit trees, and a number of other injurious species. At the station the nests of white ants were soaked with kerosene and burned, and this method of eradication was much more effective than arsenic treatment. Notes are also given on plant parasites and fungus diseases.

Report of the coffee specialist, J. W. Van Leenhoff (pp. 450–454).—Coffee plants were transplanted from the seed beds into nursery beds, of which some were treated with nitrate of soda, muriate of potash, lime phosphate, bone meal, stable manure, and Porto Rican bat guano applied alone and in different combinations. On the beds treated with bat guano, or the same mixed with other fertilizers, the plants grew twice as fast as in the other beds. The bat guano, which is obtained from caves in the island, was analyzed by the Bureau of Chemistry of this Department, which reports the following result: Total phosphoric acid, 12.93 per cent; total potash, 0.96 per cent; total nitrogen, 3.32 per cent; ammonia, 4.03 per cent; moisture, 13.86 per cent; loss on ignition, 52.33 per cent.

The plants developed well the following year and are now used in establishing experimental fields by the stump-planting system. Progress is also reported on experimental work in the improvement of an old coffee grove. The total crop of 10 acres before any experiments were made amounted to 3,387 lbs. of coffee ready for market. The cost of harvesting and marketing the crop was $2.11 per 100 lbs. After the harvest the 10 acres were divided into plats; and experiments in green manuring with leguminous crops, distance tests, renovation of the trees by cutting them down to stumps to cause new growth, and different methods of cultivation have been begun. Experiments in progress with new coffee consist in testing Porto Rican coffee and shade trees, and improved varieties of coffee and shade trees. Young plants grown from seed from the Hawaiian Islands and Ceylon have already been set out, and distance experiments have also been started in this connection.

Report on observations in Porto Rico, F. S. Earle (pp. 454–468).—This report treats of the horticultural possibilities of Porto Rico and of observations on plant diseases

and insect enemies in the island. Notes on diseases and insects affecting oranges, coffee, sugar cane, tobacco, cotton, cocoanut, cacao, papaw, beans, and cowpeas are given.

Crop experiments in 1903, A. M. TEN EYCK and V. M. SHOESMITH (*Kansas Sta. Bul. 123, pp. 181–249, pls. 10*).—These experiments were conducted on 360 plats, ranging from 0.1 acre to 5 acres in size and aggregating about 240 acres. Among the spring wheats the macaroni varieties gave the largest yield and heaviest grain. Six-rowed bearded barley gave the best results, the leading varieties—Common, Bonanza, and Mandscheuri—yielding 33.9, 33, and 32 bu. per acre, respectively. Hot weather was not so injurious to barley as it was to oats. Sixty Day oats stood first with a yield of 53.9 bu. per acre, followed by Black Beauty with 52.1 bu., Kherson with 46.7 bu., and Red Texas with 43 bu. per acre. The early varieties gave much the best results. Early sowing is recommended in order that the crop may escape blight caused by hot weather. Emmer produced 1,756 lbs. of grain, which was more than the highest yields of oats or barley obtained in this test. This crop seemed more resistant to drought, diseases, and unfavorable weather conditions than either oats or barley. Flax planted rather late yielded only 6.5 bu. per acre.

Among the millets German ranked first in the yield of hay and seed, the largest yields being 3.6 tons of hay and 25.2 bu. of seed per acre. Siberian millet ranked second. The following varieties of soy beans are mentioned as yielding more than 13 bu. per acre: Yellow, Small Yellow, Ito San, Early Yellow, Green Samarow, and Early Brown, of which the Ito San and the Yellow varieties are the most productive. The Ito San and Early Yellow rank high in earliness. Of 34 varieties of cowpeas grown, New Era gave the largest yield, 11.07 bu. per acre, and several varieties gave an average yield of 2.5 tons of dry fodder per acre. Coleman, Early Amber, Kansas Orange, and Kavanaugh varieties of saccharine sorghums gave good results. Coleman ranked first in production, with a yield of 40.5 bu. of seed and 7.41 tons of stover per acre, while Amber and Kavanaugh ranked first and last, respectively, in maturity. It was found that 50 days after harvesting, sorghum stover in the stack still contained on the average 51.7 per cent of moisture. The results with nonsaccharine sorghums showed that Yellow Milo maize and Large African millet yielded 5.27 tons of stover and 20.6 bu. of grain, and 5.33 tons of stover and 37.3 bu. of grain per acre, respectively, while Red Kafir corn and Black-Hulled White Kafir corn from seed from the same source yielded 4.42 tons of stover and 57.3 bu. of grain, and 4.07 tons of stover and 59.1 bu. of grain per acre, respectively. The Kafir corn stover contained fully as much moisture when stacked as the stover of the saccharine sorghums. Extra Early Japanese broom corn, with Genuine Dwarf as ranking second, appeared superior to other varieties for broom manufacture and also produced the largest yield of seed, 29.9 bu. per acre. A total yield of 5.25 tons of fodder per acre was obtained from pearl millet, but this crop is considered much inferior to the sorghums. Teosinte did not prove equal in value to corn, Kafir corn, or sorghum for forage.

Eighty-one varieties of corn were under test. The yields of standard varieties under the same conditions varied from 31 to 89 bu. per acre. The yields per acre of the leading varieties were as follows: Hildreth, 89.02 bu.; Brazilian Flour, 82.01 bu.; Hammett, 79.04 bu.; Mammoth, 77.12 bu.; Griffing Calico, 76.64 bu.; Klondyke, 75.70 bu.; Cocke Prolific, 75.70 bu., and Bicker Choice, 74.53 bu. Cocke Prolific and Brazilian Flour were grown from southern-grown seed. The native varieties were generally more productive than the imported sorts. The early maturing varieties from northern-grown seed produced the smallest yields, while the best yields of grain and stover were obtained from the medium to late maturing varieties. In addition to determining the yielding capacity, the varieties were scored with reference to the number of ears produced per plat, height of stalks, height of ears on the stalks, leafiness, and length and circumference of the ears. The following varieties scored highest in these points: Forsythe Favorite, 88.4 per cent; Griffing

Calico, 87.7 per cent; Nebraska White Prize, 87.1 per cent; Sander Improved, 85.7 per cent; Funk Ninety Day, 85 per cent. Heavily manured land yielded from 18 to 25 bu. more per acre than adjacent land which had received no manure. Of 29 varieties planted June 16, the following gave the best yields and matured sufficiently to make good corn: Early Mastodon, 54.4 bu.; Pride of the North, 51.95 bu.; Early Cotton King, 50 bu.; Golden Row, 49.2 bu.; Farmers' Reliance, 48.8 bu.; and Reid Yellow Dent, 50.8 bu. It was found that the number of barren stalks on the different plats varied from 0 to 40 per cent.

Experiments were made in the late planting of forage crops to compare the yields and the relative value of the fodder. The crops were sown broadcast June 24 and the best results were obtained with saccharine sorghum, Kafir corn, and corn, the yields being 7.7, 6.12, and 3.93 tons per acre, respectively. Moisture determinations from samples of the fodder taken December 25 showed 39.4 per cent of moisture in the sorghum, 36.2 per cent in the Kafir corn, and 27.01 per cent in the corn. Corn and soy beans and corn and cowpeas sown broadcast were more satisfactory as late pasture crops than either the saccharine or the nonsaccharine sorghums. Soy beans and cowpeas were eaten better by stock when grown in combination with corn than when planted alone.

Corn, corn and cowpeas, Kafir corn, saccharine sorghum, and alfalfa were tested as silage crops, and the data showed that alfalfa can be put into the silo at a less cost than any of the other crops. Saccharine sorghum and Kafir corn gave the largest yields and were handled at a less cost than corn for silage. Corn ranked second in yield of silage and cowpeas third. Experiments in baling alfalfa from the field indicated that this should be done when it is well cured and ready to be stacked. Baled in this way the hay is more likely to retain its leaves than when baled from the stack.

Report on field crops, J. H. SHEPPERD and E. G. SCHOLLANDER (*North Dakota Sta. Rpt. 1903, pp. 59–101*).—A general description of the work of the agricultural department of the college and station in 1903 is given and the results of different experiments are reported at greater length.

Plant breeding is carried on in cooperation with the Bureau of Plant Industry of this Department, and during the year over 50,000 plants of wheat, oats, barley, flax, buckwheat, millet, alfalfa, red clover, corn, potatoes, brome grass, slender wheat grass, and timothy matured in the plant-breeding nursery. The station distributed 35.75 bu. of corn, 68 bu. of wheat, and 300 lbs. of slender wheat grass to 28, 11, and 4 growers, respectively.

Forty-eight varieties of fife, blue stem, and macaroni wheat were grown in 1903. The varieties giving the largest yields in each class were as follows: Selected McKendry Minnesota No. 181 fife, 44.5 bu.; Selected Haynes blue stem, 47.3 bu., and Nicaragua macaroni, 48.8 bu. per acre. The average yield of the best 6 varieties of fife was 43.17 bu., of blue stem 41.49 bu., and of macaroni wheat 46.65 bu. per acre. The tabulated results show that in general the macaroni wheat gave larger yields than either the fife or the blue-stem varieties. Many of the leading varieties of fife and blue stem were bred at the North Dakota and Minnesota experiment stations.

The results of a fertilizer experiment with wheat are shown in the following table:

Fertilizer experiment with wheat in 1903.

Fertilizer.	Grade.	Weight per bushel.	Yield per acre.	Lodged.
		Pounds.	*Bushels.*	*Per cent.*
Acidulated bone	1N	59.75	30.4	10
Amour Grain Grower	1N	59.50	33.2	5
Ammoniated bone and potash	1N	60.25	32.2	20
All soluble	1N	60.00	31.9	8
Nitrate of soda	1N	59.50	33.0	10
Rotted manure	2N	60.00	29.5	10
No fertilizer	1N	60.00	25.7	3

Of 4 varieties of winter rye, a strain selected at the station gave the largest yield, 33.13 bu. per acre. Among 29 varieties of oats, Selected Tartarian, which came from the station plant-breeding nursery, gave the highest yield in 1903, and the highest average yield for the last 2 years, being, respectively, 77.3 and 70.6 bu. per acre. The leading varieties of barley were Success, Manshury Minnesota No. 6, and Highland Chief, yielding 45.3, 44.5, and 42.7 bu. per acre, respectively. The average yields for 1902 and 1903 were in favor of Minnesota No. 100, Manshury Minnesota No. 6, and Common Six-Rowed. A yield of 54.44 bu. of emmer per acre is reported, and a comparison of the yields of different cereals for the last 6 years shows that emmer heads the list in average yield, being followed closely by barley. The results with flax show that the varieties introduced from Argentina, Russia, and Siberia are not equal to the best common strains. The taller growing varieties all gave small yields of seed. A strain selected by the station stood high in fiber production.

Variety and culture tests were made with corn. The results indicated that among the larger growing varieties under test North Dakota No. 100, Golden Dent, Northwestern Dent, Minnesota King, and Acme, and among the flint-growing varieties Will Dakota, Will Gehu, Longfellow, King Philip, Triumph, and Mercer will prove most satisfactory in the State. A comparison of planting corn in hills and drills, in progress for 6 years, resulted in the largest average yields of air-dry fodder from drills 6 in. apart. The stalks reached the greatest length in the 42-in. drills. Hills 22 in. apart produced a much better yield than hills 42 in. distant.

The average yield of ears for 4 years from 9 different distances in the drill, varying from 6 to 36 in., shows a gradual decrease as the distance between the plants in the drill increases. The yield of fodder also diminished, but with less regularity. The thinner plantings produced the largest ears. The results also show that in the average for 4 years 6 stalks per hill gave a higher yield of fodder and of ears than thinner planting. In 1903 the percentage of ripe corn was reduced when more than 2 stalks were grown per hill. The 1, 5, and 6 stalk hills measured 55 in. in height, while the 2 and 3 stalk hills measured 60 in. The diameter of the stalks diminished with the thickness of planting.

For 2 years corn was planted in 6 in. and 42 in. drills on 6 different dates from May 18 to June 22, inclusive. The water content of the corn in the drills 6 in. apart, determined September 16 when frost interfered with the growth, increased gradually with the lateness of the planting. The green fodder from the earliest planting contained 62.4 per cent of water, while that from the planting made June 8 contained 75.5 per cent. The corn grown in drills 42 in. apart reached the greater degree of maturity. The water content on September 16 in samples of green fodder from plantings made June 1, 8, and 15, was 71.5, 76.7, and 75 per cent, respectively. As the corn in the 42-in. drills reached a greater degree of development and maturity, a high moisture content in the later plantings did not affect curing for fodder to the same extent as it did in the corn from the 6-in. drills. The wider planting admits of cutting and curing in the ordinary way, while the 6-in. drills must be mowed and cured in the swath. The average results for 4 years of a cultivation experiment are in favor of shallow cultivation during the entire season.

Turkestan alfalfa failed to pass the winter of 1902, but a second plat sown in the spring of that year was injured but little during the winter. Grimm alfalfa has given better results than Turkestan.

In the trials with red clover the strains obtained from Minnesota, Michigan, and Tennessee produced the best yields of plump and valuable seed. A one-third acre plat seeded with wheat as a nurse crop in 1902 produced at the rate of 3,615 lbs. of hay per acre. The clover on this plat was 20 in. high when harvested June 25. It is concluded from these results that in the Red River Valley clover should be sown with wheat as a nurse crop at the rate of 15 lbs. of seed per acre and a crop of hay harvested before plowing it under.

The Edgeley subexperiment station, O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta. Rpt. 1903, pp. 102–119, pls. 2*).—In connection with a general report on the work conducted at the station during the year, the results obtained with grain and forage crops are reported.

The yield of brome grass, impaired by weather conditions, was 300 lbs. of seed and 1.25 tons of hay per acre. Turkestan alfalfa, timothy, and flax were not successful. Corn following corn gave a poor yield, but corn after wheat produced a good crop of fine fodder. Rape sown in 24-in. drills at the rate of 3 lbs. of seed per acre, gave a yield estimated at 10 tons per acre. Millet sown May 29, and killed by a frost September 14, before much of it had headed, yielded about 2.5 tons per acre. There was practically no difference in the yield of wheat on plats plowed 4 and 8 in. deep. The data of grain and forage crops in rotation are tabulated.

Two varieties each of fife and blue-stem wheats were compared with 5 varieties of macaroni wheat. The 2 best yielding macaroni varieties averaged 21 bu. per acre as compared with 18.40 bu. and 15.40 bu. for the fife and blue-stem varieties, respectively. Macaroni wheat has shown itself superior in yielding capacity and in resistance to drought and hot winds. The results with 5 varieties of oats are recorded, and those of a medium growing season gave the largest yield of grain. Swedish Select oats, recently imported from Russia, produced a stiff straw of good height, well filled heads with large plump kernels, and ranked first in weight per bushel.

Four varieties of barley grown for comparison showed no marked differences in yield, but 6-rowed Manshury led in productiveness, length of straw, and healthful growth. Of 5 varieties of millet sown May 29, only Early Fortune ripened its seed. Siberian and German produced the best hay. In the test with corn, Pride of the North, Triumph, and University produced the highest stalks, with Northwestern Dent, Mercer, and Minnesota King ranking next. The early, small growing varieties of corn could not be harvested satisfactorily with a corn binder. Sorghum in a limited trial showed drought-resisting qualities and gave some promise for fodder in that section.

Report of the Insular Bureau of Agriculture for the year ending August 31, 1902 (*Ann. Rpt. Philippine Com. 1903, pt. 2, pp. 639–741, pls. 27*).—In connection with the general report of the Insular Bureau of Agriculture, brief notes on the work at the different experiment stations in the islands are given. In Malate a small plat of teosinte gave 5 cuttings between March 21 and August 10, producing at the rate of 49¾ tons of green forage per acre. A yield of 100 tons of green forage per acre during the entire year is considered possible. The total yield from 2 crops of tobacco grown from Sumatra seed was at the rate of 1,470 lbs. per acre.

Some of the points of general interest in this report, as showing the progress in organizing experimental work in the Philippine Islands, have been previously noted editorially (E. S. R., 15, p. 633).

The industry in oil seeds, C. M. DAUGHERTY (*U. S. Dept. Agr. Yearbook 1903, pp. 411–426*).—The production of cotton seed and flax seed in the United States is discussed and statistics in this connection are given. The quantities of oil-producing seeds and nuts imported and exported by France, Germany, and Belgium, and the total imports minus the total general exports for the United Kingdom and Denmark are shown in tables. The cultivation of oil-yielding seeds in foreign countries is also noted.

One-horse farm, J. S. NEWMAN (*South Carolina Sta. Bul. 84, pp. 9*).—In this popular bulletin the author urges the use of 2 horses rather than 1, together with modern improved implements on the small farms of the Southern States. A rotation including crops giving direct financial returns as well as those grown for forage and soil renovation is suggested.

Pasture, meadow, and forage crops in Nebraska, T. L. LYON and A. S. HITCHCOCK (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 59, pp. 61, pls. 6, figs. 8*).—

This bulletin describes the climate and soil conditions of Nebraska, reproduces the crop statistics of the State for 1899, presents a classification of forage plants, and reports the results of experiments with grasses and other forage plants by the Nebraska Experiment Station in cooperation with this Department.

Several tests with *Bromus inermis* made since 1897 are noted. Disking brome grass sod on April 8 produced no difference in the growth of the grass. The plats, 16½ ft. by 76 ft. in size, receiving 300 lbs. of well-rotted horse manure in the fall and 10 lbs. of nitrate of soda the next spring, yielded at the rate of 5,666 lbs. of hay per acre, as compared with 2,166 lbs. for the check plat. Manured plats produced a good aftermath and withstood drought well. Sowing at the rate of 14 lbs. per acre produced much more seed than the use of larger quantities of seed. No difference was observed between fall and spring sown plats. Other results indicated that, if the soil is in proper condition, brome grass may probably be sown from April to October 1. When sown with blue grass it was gradually crowded out, but in grass mixtures for pasture it usually showed some advantage over the other species. The results of cooperative experiments with farmers were in general satisfactory.

The tests with different varieties of alfalfa showed that Turkestan alfalfa is well adapted to Nebraska conditions and that in dry seasons it yields better than the ordinary alfalfa. Peruvian alfalfa, after producing a good stand and vigorous growth, was winterkilled. Samarkand alfalfa grew well, produced a thick stand, and proved to be drought resisting, but it was not so tall as the common or Turkestan varieties. A test of seed from different States showed that alfalfa seed should not be brought from a southern to a more northern region or from an irrigated to a nonirrigated soil.

There was no advantage in planting alfalfa in rows and cultivating it.

The use of gypsum, lime cake, and hog manure produced no marked beneficial effect. Light and heavy seed yielded at the rate of 2,500 lbs. and 3,000 lbs. of hay per acre, respectively. The second year there was a much thinner stand from the light seed. Experiments in sowing alfalfa at different times showed that on soil in good tilth and with sufficient moisture the seed may be sown at any time from spring to early fall. The best stand was obtained by sowing without a nurse crop.

On a series of plats alfalfa was sown together with various grasses. In all cases the grass grew well with the exception of timothy, which seemed to be unable to compete with the alfalfa. In a mixture comprising a number of grasses and alfalfa, orchard grass has in 3 years increased to about ⅓ of the number of plants on the plat. Brome grass grew more vigorously where the alfalfa was thickest, which seemed to indicate that it derived some advantage from the fertilizing effect of the alfalfa. Good stands were obtained on disked and broken and disked sandy prairie.

A 30-acre field was sown in April, 1889, with a mixture of 2 lbs. each of orchard grass, timothy, blue grass, tall oat grass, perennial rye grass, and white clover, 4 lbs. of red clover, and 1 lb. of alsike clover. On 5 acres of the tract, 3 lbs. of alfalfa were added. Good yields of hay and excellent pasturage were obtained in 1900 and 1901. In the spring of 1900, the field was disked and sown with brome grass and meadow fescue, which 2 grasses at present practically occupy all the ground, the alfalfa having disappeared. A tract of 30 acres of native pasture sown with blue grass and white clover in 1887 is at present mostly blue grass. As in the foregoing experiment, alfalfa sown on part of this tract was crowded out by brome grass and meadow fescue. On another field sown with brome grass, timothy, orchard grass, blue grass, and meadow fescue, brome grass gained the ascendency.

Yields of hay from meadow fescue at the rate of 2,400 lbs. per acre on one plat and of 2,836 lbs. on another are recorded. This grass did not start so early in the spring as brome grass. Trials of meadow fescue mixed with either timothy, clover, or alfalfa were all successful. Mammoth red clover proved of more vigorous growth and longer lived than ordinary red clover, but in the winter of 1902–3 it was about half winterkilled. It withstood drought better than any other clover. Alsike

clover also stood drought well and gave good results on moist ground. The results obtained with redtop, side oats grama, and wheat grasses are briefly described, and notes on the work with less important grasses and leguminous forage crops are given.

Annual forage crops, including sorghum, millet, cowpeas, small grains, corn, soy bean, rape, Canada field pea, and vetch are discussed with reference to their value for Nebraska, and the yields obtained in culture tests with some of these crops are given. A list of plants which have been tested but can not be recommended concludes the bulletin.

Pasture, meadow, and forage crops, T. L. Lyon and A. S. Hitchcock (*Nebraska Sta. Bul. 84, pp. 66, figs. 5*).—An account of the cooperative work noted above from another source (E. S. R., 16, p. 148).

A six-year rotation of crops, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Bul. 90, pp. 81–118, pl. 1*).—The results obtained with 3 and 4 year rotations have been previously noted (E. S. R., 12, p. 1030). The experiments here discussed were conducted on 6 plats of poor grass land. The succession of crops for the rotation was as follows: Corn on grass sod, potatoes, winter rye, common red clover with timothy and redtop, grass, grass. A detailed account of the treatment of each of the plats for the term of the rotation is given. The purpose of the experiment was to ascertain if by the use of small quantities of stable manure, supplemented by commercial fertilizers, or if by the use of commercial fertilizers alone this exhausted soil could be improved and finally its fertility be maintained at a profit.

It was found early in the experiment that the influence of wood ashes could be profitably duplicated by the use of lime aud potash salts. One of the plats in the absence of lime and wood ashes showed only a trace of timothy and only 4.8 per cent of red clover, while on another plat which received wood ashes timothy constituted 22.4 per cent and red clover 37.9 per cent of the herbage. A comparison of the yields during the 2 rotations is given in the following table:

Comparison of yields in the first and second course of the rotation.

	Corn.			Potatoes.		Rye.			Hay.	
	Year.	Yield of grain per acre.	Yield of stover per acre.	Year.	Yield per acre.	Year.	Yield of grain per acre.	Yield of straw per acre.	Year.	Yield per acre.
First course:		*Bushels.*	*Tons.*		*Bushels.*		*Bushels.*	*Tons.*		*Tons.*
Plat No. 2	1893	16.22	1.75	1894	179.40	1895	....	....	1896	5.83
Plat No. 12	1894	60.65	1.75	1895	130.87	1896	28.03	1.58	1897	2.48
Plat No. 10	1895	44.73	1.23	1896	277.00	1897	20.89	1.67	1898	3.84
Plat No. 8	1896	59.64	1.93	1897	290.00	1898	10.45	1.78	1894	1.15
Plat No. 6	1897	71.50	2.85	1898	304.60	1899	17.28	1.74	1894	.68
Plat No. 4	1898	77.00	4.05	1893	130.83	1894	38.75	1.92	1895	2.81
Second course:										
Plat No. 2	1899	68.47	3.33	1900	247.50	1901	13.17	1.36	1902	5.58
Plat No. 12	1900	83.14	3.75	1901	289.40	1902	25.72	2.33	1903	5.32
Plat No. 10	1901	50.43	2.68	1902	382.33	1903	23.39	2.14	......	....
Plat No. 8	1902	72.58	2.97	1903	344.99	......	....	....	1901	3.80
Plat No. 6	1903	71.42	3.18	......	....	......	....	....	......	....
Plat No. 4	......	....	....	1899	183.33	1900	18.93	1.72	1903	4.11

The crops of hay recorded in the table represent the first and last full crops thus far grown in the 2 rotations. The high yield of hay on plat 2 in 1896 is considered to be due to an application of 1,068 lbs. of air-slaked lime per acre in 1894. The top dressing first employed for grass land in these experiments consisted of 120 lbs. of muriate of potash, 120 lbs. of nitrate of soda, and 300 lbs. of dissolved boneblack or its equivalent of acid phosphate per acre; but beginning with 1901 it was changed to 350 lbs. of nitrate of soda, 200 lbs. of muriate of potash, and 500 lbs. of acid phosphate per acre. During the second course of the rotation the potato formula was changed to 200 lbs. of nitrate of soda, 275 lbs. of high-grade dried blood, 800 lbs. of

low-grade acid phosphate, and 300 lbs. of muriate of potash per acre, which was applied entirely in the drill.

The general results of the experiments showed that rye and grass, especially on fine and compact soils, should come early in the rotation and be followed by corn and potatoes after the tilth of the soil has been materially improved. It is believed that, if lime or wood ashes had been applied at the very beginning of the tests, regardless of the crop, the results would have been more satisfactory. The authors believe that, if the rotation is begun as suggested and the fertilizers used during the second course are applied as described, most Rhode Island soils may be profitably renovated and their fertility maintained solely by the use of commercial fertilizers. The financial results obtained on the different plats are shown in tables.

The department of agronomy, L. A. MERRILL (*Utah Sta. Rpt. 1902, pp. XIX–XXXIII*).—The work and equipment of the department are briefly noted and experimental results are recorded. A rotation experiment has been in progress for only 2 years, but some differences as a result of the treatment are already noticed. Two plats upon which wheat is to be grown continuously, the one receiving barnyard manure each year and the other receiving no fertilizer whatever, yielded in 1901, 20.66 and 17.83 bu., and in 1902, 30 and 10.83 bu., respectively. In all cases the yields for 1902 were much greater from the manured than from the unmanured plats, the increase for wheat being 24 per cent in one rotation, 177 per cent in another, and 99 per cent in a third. The results further show the need of fertilization for the successful production of sugar beets. Comparing the results from the barnyard manure plat with those from the plat receiving 200 lbs. of nitrate of soda per acre, it is seen that in both years the yields were in favor of the manure. Summer fallow every third year to follow wheat and oats does not show as large an increase as the continuous cropping with the yearly use of barnyard manure.

Forty-eight varieties of fall wheat were tested, Turkey leading with a yield of 42.17 bu. per acre, and being followed in productiveness by Red Chaff, Siberian, and Ruby. Canadian Wonder, Red Cross, and Ramsey, standing last in the list, yielded each 31.95 bu. per acre. The average yield for the 2 years of the 2 subsoil plats was 9.5 per cent better than that on plats plowed 10 in. deep but not subsoiled.

Thirty varieties of spring wheat were grown, and the highest yield obtained per acre was 44.78 bu. Sixty-Day oats yielded in 1901, 87.18 bu. as compared with 68.75 bu. for the variety next highest in yield; and in 1902 the yield was 88.89 bu., again considerably higher than that of any other variety.

The following varieties of barley, named in the order of highest yield, were grown: Salzer California Prolific, Highland Chief, Mandscheuri, Silver King, Success, California, and Black Barley.

Twelve varieties of macaroni wheat were grown without irrigation, giving an average yield of 32.11 bu. per acre. The leading variety, Mahmoudi, produced a yield per acre of 42.46 bu.

Several varieties of sorghum were tested and the chemical analyses of the cane and the sirup are given. Rape, sand vetch, flat pea, soy bean, giant spurry, cowpeas, velvet beans, teosinte, and lentils have made good growth at the station.

Cross-bending test of stems in cereal breeding, P. HOLDEFLEISS (*Illus. Landw. Ztg., 24 (1904), No. 26, pp. 293, 294, fig. 1; Deut. Landw. Presse, 31 (1904), No. 29, p. 256, fig. 1*).—The value in cereal breeding of cross-bending tests of the straw to determine its strength, with a view to selecting seed from plants with strong stems and consequently with a reduced tendency to lodge, is discussed and methods of conducting the tests together with the apparatus used are described.

The cultivation of corn, C. P. HARTLEY (*U. S. Dept. Agr. Yearbook 1903, pp. 175–192, pls. 5, figs. 7*).—In the discussion of the subject the author considers the production of corn in its relation to the fertility of the soil, means of preventing soil

washing, the retention of soil moisture, fertilizers and crop rotation, and the different phases of the culture of the crop, such as plowing, planting, and cultivation.

Selection of corn and wheat, E. F. Ladd (*North Dakota Sta. Rpt. 1903, pp. 36–41*).—The results with 8 samples of wheat under test since 1900 for the purpose of determining whether the protein content in wheat can be increased by selection, and whether wheats retain this property from year to year, are given in a table. The samples did not all continue to increase their protein content, and in some of them it was even lower in 1903 than in 1900. In 1901, a season unfavorable to full maturity, the protein content was exceptionally high for all samples. A study of the gluten content and of the gluten constituents is reported in progress.

Analyses of corn planted at different distances; of samples selected for high protein content; of the stalks, cob, and kernel of individual plants, and of corn planted on different dates are reported. In all cases, except in the study of individual plants, the results are compared with those of previous years.

Consumption of cotton in the cotton States, J. L. Watkins (*U. S. Dept. Agr. Yearbook 1903, pp. 463–478, pls. 3, fig. 1*).—The history of cotton manufacture in the United States is reviewed by periods, and the consumption and production of cotton and the number of mills and spindles in operation in South Carolina, North Carolina, Georgia, Alabama, Tennessee, and Virginia in different years, from 1850 to 1903, are presented in tables. In addition, the cotton consumed with the number of mills and spindles in operation in Mississippi, Louisiana, Texas, Arkansas, Kentucky, and Missouri at the close of each decade from 1860 to 1900, inclusive, and in 1902 and 1903 are given, and the condition of the cotton industry in various countries during the past 20 years is briefly noted. A tabulated summary of the statistics presented, showing the consumption and production of cotton in the Southern States from 1850 to 1903, concludes the article.

The growing of long-staple upland cottons, H. J. Webber (*U. S. Dept. Agr. Yearbook 1903, pp. 121–136, pls. 5*).—This paper discusses the importance of extending the culture of long-staple upland cottons, notes the history of their introduction, and describes briefly the principal races which are now being grown. Directions for the improvement of varieties, selection of seed, cultivation, picking, ginning, baling, and marketing are also given.

The A, B, C of cotton planting, D. Morris (*Imp. Dept. Agr. West. Indies, Pamphlet 31, 1904, pp. 60*).—The principal facts of cotton culture are presented in a series of questions and answers.

Principal commercial plant fibers, L. H. Dewey (*U. S. Dept. Agr. Yearbook 1903, pp. 387–398, pls. 5*).—After reviewing the importance of the fiber industry and outlining a classification of fibers into cottons and hard and soft fibers, the author presents discussions of American upland, Sea Island, Egyptian, India, and Peruvian cotton, flax, hemp, jute, Manila fiber, sisal, New Zealand hemp, Mauritius hemp, and istle.

Lupines as green manure for rye, Causemann (*Deut. Landw. Presse, 31 (1904), No. 39, pp. 344, 345*).—Rye was sown on light soil after lupines had been turned under by shallow plowing. The seeding was late, October 15, but the crop wintered well and made a rapid growth the following spring.

The percentage of husk in different varieties of oats, C. Hauter (*Illus. Landw. Ztg., 24 (1904), No. 25, pp. 279, 280*).—The percentage of husk determined in 32 varieties is reported, together with the weight of the oats per hectoliter and the weight of 100 whole and husked grains. The grains with the husks removed constituted from about 70 to 75 per cent of the whole grain. Potato and a variety of side oats stood highest in the percentage of husked grains.

Irish potatoes, E. C. Green (*Texas Sta. Bul. 71, pp. 16, figs. 4*).—This bulletin discusses the results of experiments at Troupe Substation. The results of a culture test show that planting 3 in. deep produced a larger total yield and a larger per-

centage of marketable tubers than planting $4\frac{1}{2}$ or 6 in. deep. Shallow planting also produced earlier maturity. Level cultivation proved more profitable than throwing soil to the row and hilling the plants. A second crop of Triumph from home-grown seed ripened a week later than the same variety grown from northern seed. Home-grown and northern-grown seed of Triumph planted March 26, yielded 36 and 24 bu. per acre, respectively. Thorburn, Irish Cobbler, and Eureka, yielding 68, 67, and 53 bu. per acre, respectively, were the most productive among the varieties tested on plats which received no fertilizer.

In connection with fertilizer experiments it was observed that the gray, sandy clay soil with red subsoil at the station responded more profitably to acid phosphates than to any other single fertilizer. In complete fertilizer applications over 6 per cent of potash was unprofitable, while from 8 to 10 per cent of phosphoric acid largely increased the yield. Cotton-seed meal applied shortly before planting did not become available in time to be of benefit to early potatoes.

Competitive potato culture in Belgium in 1903, L. LACROIX (*Jour. Soc. Cent. Agr. Belg., 51 (1904), No. 5, pp. 185–187*).—The variety grown was President Kruger, and the areas devoted to the test varied from 1 to more than 25 ares. The maximum yields per hectare were as follows: Plats containing more than 25 ares, 59,500 kg.; plats from 10 to 25 ares in size, 65,150 kg.; plats from 5 to 10 ares, 64,532 kg.; and plats containing 1 to 5 ares, 44,422 kg.

The effect of frequent cultivation on the yield of potatoes, BACHMANN (*Deut. Landw. Presse, 31 (1904), No. 19, p. 162*).—Potatoes grown on a poor, sandy soil were given different fertilizer applications and some plats were hoed once and others 3 times. Frequent cultivation in all cases gave the highest yields, the greatest increase being obtained on the plats receiving a complete fertilizer. Where nitrogen was not given in the fertilizer the increase was smallest, while the absence of phosphoric acid did not show such marked effects on the yield.

Variety tests with potatoes at Capelle, F. DESPREZ (*Semaine Agr., 24 (1904), No. 1192, pp. 93, 94*).—The tests comprised varieties for industrial and feeding purposes and for general consumption. The leading varieties in the different groups were as follows: For industrial and feeding purposes, Géante blanche, G. bleue, Professor Withmann; for industrial purposes and general consumption, Jaune ronde, Professor Maercker, Fleur de pêcher; table varieties, Georges Poulet, Magnum bonum, Preciosa, Blanche française; and as an especially fine table variety, Marjolin hâtive.

Rice, W. C. STUBBS, W. R. DODSON, and C. A. BROWNE, Jr. (*Louisiana Stas. Bul. 77, 2. ser., pp. 363–393, pls. 18*).—This bulletin is a revision of Bulletin 61 of the station (E. S. R., 12, p. 741), including additional information gained since it was issued. Statistics on the production and importation of rice are shown, the lands suitable for rice culture in Louisiana are described, and general directions for the culture of the crop are given. The analyses of water from different localities used in irrigating rice are recorded in a table, and the fertilizing elements contained in these waters per acre irrigated are estimated.

Green and yellow grained rye and their yields under field conditions, REICHERT (*Illus. Landw. Ztg., 24 (1904), No. 20, pp. 217–219, figs. 7*).—Different experiments with the 2 kinds of rye are reviewed, and attention is called to the fact that on heavy as well as light soils the yields were in favor of the green-grained varieties.

In all tests but one the protein content of the green-grained rye was larger than in the yellow-grained strains. In the one experiment the green rye contained 12.7 per cent of protein and the yellow 14.4 per cent, but the total amount of protein produced per morgen was 265.17 lbs. and 167.04 lbs., respectively. Average results show that the green-grained varieties contained about 4 per cent more protein than commonly grown varieties of rye.

Relation of sugar beets to general farming, C. O. TOWNSEND (*U. S. Dept. Agr. Yearbook 1903, pp. 399–410, pls. 3*).—This article, in addition to pointing out the

relation of sugar-beet culture to general farming, gives directions for the culture of sugar beets and discusses the cost of production and the future of the industry.

Comparative production of alcohol and sugar from the beet (*Jour. Soc. Cent. Agr. Belg., 51 (1904), No. 7, pp. 265, 266*).—Figures are given showing that when alcohol brings 35 francs per hectoliter and sugar 26 francs per kg., distillery beets may be used as well for the production of one as for the other.

Comparative results of seedling sugar canes D. 74 and D. 95 with our home sugar canes (Louisiana Striped and Louisiana Purple), W. C. STUBBS and R. E. BLOUIN (*Louisiana Stas. Bul. 78, 2. ser., pp. 46*).—The history of the 2 seedling canes is given. The analyses of the different canes for the years 1894 to 1903, inclusive, are reported, and the character of the seasons and the results are briefly noted. It is shown that in every instance the 2 seedling varieties were lower in glucose content than the home canes.

A low glucose content is of great advantage in working the juice. D. 74 gave especially favorable results in this respect. The average analysis also showed that this seedling contained 1.8 per cent more sucrose, and D. 95 0.9 per cent more than the home canes. D. 74 yielded 5.68 tons of cane more per acre than the 2 native varieties, while D. 95 was about equal to them in cane production. The financial results presented are based on a value of 4 cts. per pound for yellow clarified sugar, giving half to the producer of the cane and half to the manufacturer of the sugar. On this basis the crop of plant cane and first year's stubble of D. 74 gave an average increase of $39.70 per acre and D. 95 of $21.81 over the home canes; and when the plant crop and the first, second, and third years' stubble were considered, the corresponding figures were $26.28 and $28.14 per acre, respectively.

The results obtained in the sugar house indicated a marked superiority of D. 74 over the 3 other canes, although D. 95 gave better returns than the 2 native sorts. In total extraction D. 74 showed an increase of 7.87 per cent, or nearly 11 per cent in the juice over home canes. A summary of the results gives an increase of 2.34 per cent in extraction, and of 40.7 lbs. of sugar per ton of cane ground in favor of the 2 seedling canes. Cooperative tests made by 27 planters throughout the State confirmed the results obtained by the station. "D. 74 is more vigorous, a more rapid grower, gives a larger tonnage, is an erect cane, and believed from this to be more economical in harvesting, stubbles well if not better than home canes, gives a larger extraction, and has a larger sugar content, yielding more sugar per ton and giving a greater tonnage per acre than home canes. The same remarks in a lesser degree apply to D. 95."

Tobacco culture in South Carolina, T. B. YOUNG (*South Carolina Sta. Bul. 86, pp. 21, figs. 4*).—After briefly reviewing the history of tobacco culture in South Carolina and giving statistical data showing the increase in the tobacco production of the State for a series of years, this bulletin describes the culture, harvesting, and curing of the crop, and presents preventative and remedial measures against the insect enemies and diseases of the plant.

Macaroni wheat, J. H. SHEPARD (*U. S. Dept. Agr. Yearbook 1903, pp. 329–336*).—A discussion is given of the introduction, increase in production, and methods of cultivation of macaroni wheat, and the results of a study of the chemistry and milling factors of this class of wheat, which have been previously noted (E. S. R., 15, p. 1073). The different uses of macaroni wheat are briefly noted.

HORTICULTURE.

Second report on the pithiness of celery, C. F. AUSTIN and T. H. WHITE (*Maryland Sta. Bul. 93, pp. 95–101*).—Further work at the station in the comparison of American-grown and French-grown celery seed as regards the production of pithy and green stalks confirms the results reported in Bulletin 83 of the station (E. S. R.,

14, p. 250), to the effect that French-grown seed produces plants true to type, while American seed produces plants many of which are pithy and green. This result is believed to be due to the more thorough "rogueing" practiced by French seedsmen. In the station experiments seed was raised from a typical stalk of the Golden Self-Blanching variety that was completely pithy. Of 12 plants grown from this seed every one was pithy, and 11 of the 12 developed into large, coarse-growing green plants having no resemblance whatever to the type of Golden Self-Blanching.

"During the same year seed was saved from a solid stalk and from a pithy stalk of Dwarf Golden Heart. From the seed of the solid stalk 14 plants were started and 12 harvested. The 12 plants were true to the type and free from pithiness. From the pithy stalk, 20 plants were raised and every one pithy. They showed as decided reversion of type as the plants from the pithy seed of the Golden Self Blanching variety. Many of the plants from the pithy seed showed the fine parsley-like foliage so common in the wild species.

"After giving this matter careful study there seems to be no doubt but that pithiness in celery is due to the parent plant, and not to any extent to the soil, methods of culture, etc. We believe that the foregoing results fully prove the inference made in Bulletin 83, that pithiness in American celery is due to a lack of 'rogueing' or removing of the pithy plants from the seed beds of American celery seed growers. We also believe that green plants that are not true to the type are caused by the same oversight, namely, by not removing from the seed beds every plant that does not conform to the type of Golden Self-Blanching celery. From a very small amount of work with several other varieties of celery, we are convinced that what is true of the Golden Self-Blanching is true of them.

"The cause of pithiness is hereditary and dates back to the seed-producing plant. The difference in soil, cultivation, season, methods of handling, etc., has very little to do with causing pithiness. The seed is contaminated before it reaches the grower, by a condition that he can not help."

A table is given showing the relative amount of pithy and green celery produced by seed from 29 different seed firms. In some cases as much as 30 per cent of the plants grown were pithy. It is believed that much of the so-called French seed obtained from American sources is adulterated with American seed, and directions are given for detecting such adulterations. The authors believe that "just as good seed can be grown in this country as in Europe, if our growers will give the same care and attention to it. In our work it has been the rarest case to find a pithy or green stalk in celery seed that is imported direct from the best growers in Europe. We believe that such a record can be established by our American growers, if they will 'rogue' their plants, by removing all plants that are pithy and that do not conform to the type of the variety wanted."

Ovidius, a new winter vegetable, G. T. GRIGNAN (*Rev. Hort.* [*Paris*], *76* (*1904*), *No. 8, pp. 177–179, figs. 2*).—Under the name of "Ovidius" the plant *Crambe tataria* has this year been introduced to French commerce. One of the peculiarities which it is claimed must be observed in the culture of this plant is that the seeds must not be covered. If covered with soil they fail to germinate. Germination at best appears to be very slow and irregular. In the fall the young plants are covered over with earth about 2 meters deep, through which the blanched stalks push their way the following March or April. One of the advantages of the plant is that it comes early in the season before asparagus. The decapitated plants form new shoots which serve for production the following year. Directions are given for preparing the plant for the table.

The seeds of garden beans, DENAIFFE (*Jardin*, *18* (*1904*), *No. 412, pp. 116–118, figs. 4*).—French varieties of garden beans are classified and illustrations given of the seeds of about 60 varieties.

Cross fertilization (*Jardin, 18 (1904), No. 412, p. 114*).—It is stated that in some experiments recently reported by M. Leclerc, melons were cross-pollinated with the pollen from melons and from cucumbers. In the latter case there was a marked diminution in the sugar content of the melons, held to be due to the effect of cross-pollinating with cucumber pollen. Melons pollinated with pumpkin and vegetable marrow pollen were also similarly affected. It is pointed out, therefore, that melons should not be planted near these vegetables.

Department of horticulture, C. B. WALDRON (*North Dakota Sta. Rpt. 1903, pp. 120–123*).—Brief notes are given on the culture of plums, apples, strawberries, currants, gooseberries, raspberries, and asparagus at the station. Asparagus rust was very destructive in 1902. Covering the beds heavily with straw in August of that year apparently checked the development of the rust in 1903. It is noted that 2 new varieties showed no sign of rusting during the first season grown.

Experiment station work with apples, C. B. SMITH (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 537–570*).—A summary is here given of the cultural experimental work reported by the experiment stations in the United States since 1888 with apples. Foreign experimental work along the same lines, so far as available, has been included.

The summary covers the work done on period of growth of the tree; the characteristics of apple buds and pollen; self-sterility in apples; crossing; root-grafting; planting and pruning trees; root-pruning; hardy stocks; orchard cultivation and cover crops; fertilizing orchards; girdling to produce fruitfulness; thinning the fruit; harvesting and storing apples; cold storage; composition of fruit, trees, nursery stock, etc.; and the utilization of waste apples for evaporation, jelly, cider, vinegar, marmalade, etc. The article has also appeared as a separate.

Notes on apple culture, C. F. AUSTIN (*Maryland Sta. Bul. 92, pp. 55–94, figs. 34*).—The author in this bulletin calls the attention of Maryland orchardists to some of the principles and methods that are considered absolutely essential to successful apple growing. Very complete directions are given for the care and management of orchards, including budding, grafting, and pruning.

Relation of cold storage to commercial apple culture, G. H. POWELL (*U. S. Dept. Agr. Yearbook 1903, pp. 225–238, pls. 6*).—The author discusses the present status of the apple industry as regards markets, marketing, cold-storage development, and the proper harvesting and handling of apples to secure the best results in cold storage. The essential points in the article have been brought out in an earlier publication of the Department (E. S. R., 15, p. 581).

An apple for the Tropics (*Gard. Chron., 3. ser., 35 (1904), No. 905, p. 280*).—It is stated that M. d'André has found a new species of Pyrus at the summit of Lang-Bian, at Annam at an altitude of 2,000 meters. The tree is without spines. The flowers have not yet been seen, but the fruit is 4 to 5 cm. across, greenish yellow, and of a rough flavor like that of a crab apple. The climate of Lang-Bian is similar to that of southern Europe. "The importance of the discovery of this new Pyrus rests in the circumstance that it may be used as a stock whereupon European varieties may be grafted," and grown in tropical and subtropical countries.

The lemon industry of Sicily (*West Indian Bul., 5 (1904), No. 1, pp. 63–75*).—Considerable information, obtained largely through the English consul at Palermo and from diplomatic and consular reports, is here given on the citrus industry of Sicily. Cultural methods and the prevailing custom of packing, shipping, gathering, etc., are noted. Some notes on the pickling of lemon and orange peel, and the manufacture of essence are included.

Promising new fruits, W. A. TAYLOR (*U. S. Dept. Agr. Yearbook 1903, pp. 267–278, pls. 7*).—Descriptions, with colored illustrations of the fruit, are given for the Akin apple, a variety well adapted to the fancy fruit trade in the larger cities; the Terry apple, a variety considered very promising for the South; the Hiley peach, a

commercial sort of good shipping quality and excellent flavor, originated in Georgia; the Welch peach, a promising hardy sort obtained in a collection of Hill Chili seedlings; the 2 varieties of prunes, Splendor and Sugar, originated by Luther Burbank; the Headlight grape, originated by T. V. Munson, and especially promising in the South on account of its vigorous growth, disease-resistant foliage, productiveness, and early ripening; and the Cardinal strawberry, a promising commercial sort originated in Ohio.

A new method of budding (*Queensland Agr. Jour., 15 (1904), No. 1, pp. 476, 477, fig. 1*).—In the method described a piece of bone was sharpened like a lead pencil and fitted with a handle. This was used to make incisions into the bark of a 10-year-old peach tree, into which buds were fitted. The buds were held in place by tacking on a small piece of leather, using upholsterers' half-inch gimp pins "which being enameled do not rust." As the buds swelled the tacks were loosened.

The method is recommended for all old trees requiring new wood, "an advantage being that it does not interfere with the tree bearing fruit while the buds are being matured. No string or clay or grafting wax is required, as with the old system." The method is illustrated.

Sexual hybridization and variation by grafting, A. JURIE (*Rev. Vit., 21 (1904), No. 543, pp. 519–523, figs. 2*).—Further evidence is presented to show that hybridization of grapes by grafting can actually take place. Photographs of the changes in grape seeds brought about by grafting are given.

Studies on the manuring of Chablis grapes, E. ROUSSEAUX and G. CHAPPAZ (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), Nos. 15, pp. 460–467; 16, pp. 477–487*).—An account of investigations made to determine the fertilizer requirements of the vineyards of Chablis. Analyses with reference to fertilizer constituents are given for the dry leaves and branches and of the marc, wine, and lees obtained from typical vines grown in the vineyards of Chablis. A study was also made of the geology and of the physical and chemical composition of the soil and subsoil in a large number of vineyards throughout the region.

With these data and data from other sources on the effect of different fertilizers on the production and quality of wine, methods of manuring Chablis vineyards are worked out. It was found that typical vines of the district withdraw yearly from the soil the following amounts of fertilizing constituents: Nitrogen, 32 kg. per hectare; phosphoric acid, 6 kg. per hectare; and potash, 27 kg. per hectare. The soils of Chablis were generally found strongly calcareous, rich in potash, fairly rich in phosphoric acid, but a little below normal in nitrogen. They contained only a small amount of gravel, the larger part being made up of fine sand and clay. They would be classed as heavy soils, but owing to the large amount of lime they contained were very permeable and easily worked.

Allowing, therefore, for certain losses which occur in applying fertilizers and for the fact that the vine roots do not reach all the fertilizers applied, and taking into consideration the effect of the fertilizers on the quality of the wine, the authors recommend the use of about 50 kg. of nitrogen per hectare in the vineyards of Chablis and 50 kg. of phosphoric acid. The use of additional amounts of potash with these soils appears to be without effect and is not recommended.

In order that the maximum effect of the commercial fertilizers used may be obtained, an occasional manuring of the vineyards with barnyard manure is recommended. Specifically it is recommended that every third year the vineyards of Chablis be manured with 10,000 to 12,000 kg. of barnyard manure supplemented with 250 kg. of superphosphate. In each of the two intervening years apply 300 kg. of superphosphate and 300 kg. of nitrate of soda per hectare. If farm manure is difficult to obtain, then apply it only every fifth or sixth year, and in the interval use yearly 700 kg. oil cake, 100 kg. nitrate of soda, and 300 kg. superphosphate per hectare.

Grafting European vines on phylloxera-resistant stocks, M. BLUNNO (*Agr. Gaz. New South Wales, 15 (1904), No. 6, pp. 557–572, figs. 18*).—An extensive review of this subject.

Tests of etherization for grapevines, F. CHARMEUX (*Jardin, 18 (1904), No. 416, pp. 188, 189, fig. 1*).—One-year-old grafted grapevines dug in part in the autumn before freezing weather came and kept buried in a cellar, and in part in December after there had been freezing weather, were placed February 3 in 2 jars holding 12 liters each, sealed air-tight, and submitted to the fumes of 3.5 and 4 gm. of ether, respectively, for 48 hours. The roots of the vines were covered with about 4 liters of sand.

The temperature during etherization was kept at 15° C. After etherization the vines were forced in a house held at 20° in the daytime and about 17° at night. Three days later the vines dug before freezing had their buds well swollen and nearly open, while the others had apparently made no growth. At the end of 8 days the early-dug vines were in full vegetation, while on the late-dug vines the buds were just beginning to start. Some control vines that had not been etherized were still in complete repose at this time and did not show signs of growth until about the twelfth day.

It was noticed in the experiment that different varieties and stocks were not all affected alike by etherization, the degree of vegetation being much stronger in some than in others on the same date. In some other experiments Chasselas, Rose, and Gamay-Teinturier-Freau were etherized with 3.5, 4, and 4.5 gm. of ether, respectively. Ten days later the Gamay-Teinturier-Freau, etherized with 3.5 gm., had a good appearance and appeared to be growing where the larger amounts were used. With the Chasselas and Rose, however, the growth with 3.5 gm. was practically nil for a few days and then slowly caught up with the others. When 4 gm. were used all the plants were weaker than the others, while with 4.5 gm. all the plants were completely destroyed.

The effect of etherization on the forcing of plants, G. BELLAIR (*Rev. Hort. [Paris], 76 (1904), No. 14, pp. 333–335*).—This is an abstract of a paper presented by M. Aymard at the Congrès horticole in 1904. According to M. Aymard, success in etherization depends upon the amount of ether employed, the duration of its action, and the temperature during the operation. A study of these factors led to the following deductions:

Anesthetics produce the same effect on vegetation as freezing or drought. Their effects are in proportion to the temperature when used, but inversely proportional to the amount of protection afforded the buds by the bud scales. The amount of liquid used and the duration of action of the vapors are in proportion to this same protection, but inversely proportional to the number of freezings the plants may have received, and proportional to the time between when the operation is performed and the time when the treated plant would vegetate naturally.

Caution must be observed not to treat the plants at too high a temperature. At 25° C., with 35 gm. of ether per hectoliter of air space, the buds were blasted. At 24° the action of ether was also harmful. The best temperature was not determined, but it is believed that it should not exceed 20°. M. Aymard believes that anesthetics act on vegetable tissue as dehydrating agents. As proof of this he found that roots of Lily of the Valley, placed under a bell jar with phosphoric anhydrid and other drying liquids, forced even more quickly than when submitted to ether vapor. It was found also that etherized plants lose considerable in weight.

The anesthetic effect of chloroform is about 4 times as strong as ether, and, therefore, when this agent is used, only about $\frac{1}{4}$ the quantity should be taken. A good combination was found to be 20 gm. of ether and 5 gm. of chloroform per hectoliter of air saturated with vapor. The quantity used should be greatest early in the season and less toward the end of the season. Thus, at the beginning of the season

40 gm. of ether or 14 gm. of chloroform may be used for 72 hours in the case of several varieties of lilacs, while late in the season 25 gm. of ether or 8 gm. of chloroform used 48 hours would be sufficient. Commenting on the above paper, M. Bultel claimed to have secured good results in the etherization of strawberries.

Experiments to determine the effect of ether and chloroform on plants, J. BOLLE (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 182, 183, figs. 2*).—An account of experiments made to determine the forcing effect of ether and chloroform on plants, with an announcement of experiments under way to determine the effect of the same agents in forcing grape and rose grafts or cuttings, etc.

Lilacs (*Syringa vulgaris*) subjected to the fumes of chloroform the last of November were in full bloom by Christmas, while control plants otherwise handled in the same manner had made no development whatever. Like results were secured with *Azalea mollis*, Hortensia, and roses which were treated after the leaves had fallen.

The possibilities of the western sand cherry, N. E. HANSEN (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 102–104*).—As a result of fruiting thousands of sand cherries (*Prunus besseyi*) the author is of the opinion that this fruit can be raised to advantage upon the most exposed prairies. Of a hundred selected varieties some have borne fruit ¾ in. in diameter and of good enough quality to eat out of hand. It hybridizes readily with plums and other members of the genus. Seedlings fruit well in 3 years. When worked on native plum stock fruit is obtained in 1 year from the bud or graft; and on heavy soils heavier yields are obtained than on own roots.

The "Rocky Mountain Dwarf Cherry," introduced to commerce from Colorado, is considered to be a seedling sand cherry. The eastern sand cherry (*Prunus pumila*) is considered far inferior to the western form. The author believes that it will prove valuable as a dwarf stock for peaches, apricots, and Japanese and native plums.

Experimental forestry: Rubber, C. F. M. SWYNNERTON (*Rhodesian Agr. Jour., 1 (1903), No. 3, pp. 50–53*).—An account of the planting and growth of several rubber-producing trees and plants in Rhodesia. The greatest success in germinating Ceara rubber seed occurred when both edges of the pointed end of each seed were ground down until the kernel was just visible. The point was also ground down slightly, taking care not to injure the germ. Most of the rubber has been planted at an elevation of 4,000 ft. Trees planted in 1900 average 13 to 14 ft. in height.

The most rubber has been obtained from these trees by pricking with an instrument resembling a spur, which was run down 3 sides of the tree. "This method produced the greatest flow of latex and damaged the tree least." The largest amount obtained from a tree was a ball about ¾ in. in diameter. Landolphia has been planted over 200 acres of virgin forest. This plant makes a slow growth and gives a low yield of rubber of good quality, and is not recommended except under special conditions.

Formalin in treating Castilloa rubber (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 9, pp. 285, 286*).—An account is given of the treatment of latex from mature trees with formalin for the purpose of coagulating the rubber. The quality of rubber obtained was excellent, and it is thought that rubber thus treated may keep much better on account of the intimate mixture of this preservative with the rubber globules.

Hevea brasiliensis in the Malay Peninsula, S. ARDEN (*Agr. Prat. Pays Chauds, 3 (1904), Nos. 16, pp. 404–440, figs. 7; 17, pp. 550–573, figs. 6*).—A popular account of the methods observed in the culture of *Hevea brasiliensis* in the Malay Peninsula.

Extraction of gutta-percha from the leaves, W. R. DUNSTAN (*Agr. Bul. Straits and Federated Malay States, 3 (1904), I, No. 4, pp. 128–130*).—Leaves of *Palaquium pustulatum* (?) were forwarded from the Straits Settlements to London, where they were analyzed and found to contain about 2 per cent of pure gutta and a large amount of resinous substance. It is believed that had the fresh leaves been analyzed larger amounts of gutta would have been found.

Report on gutta-perchas from the Straits Settlements, W. R. Dunstan (*Agr. Bul. Straits and Federated Malay States, 3 (1904), I, No. 4, pp. 121-128*).—Analyses are given of 6 samples of gutta-percha obtained from as many different species of plants, with estimates as to the commercial value of each. The best sample was obtained from *Dichopsis gutta*, which contained 77.1 per cent gutta and 16.9 per cent resin, and was valued at about $1.50 per pound.

Para rubber in Selangor, S. Arden (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 10, pp. 316-320*).—The author's earlier experiments indicated that the first 3 ft. of the trunk from the base of the tree contains the largest amount of latex, while if tapping is extended beyond 6 ft. from the base the latex decreases in quantity and the quality is poorer, containing a smaller amount of caoutchouc and larger proportion of resin, thus yielding a less elastic rubber. It is thus seen that the tapping area is limited, "for no matter how skillfully the wounding is accomplished the result will be a rough and broken surface which will be found difficult to work, while the disconnecting tissue will undoubtedly interrupt the flow of latex if tapping operations are repeated before cicatrization is complete."

Experiments were therefore made to determine the relative yield of rubber obtained by opening new wounds each day, beginning at 6 ft. from the base of the tree and making a V-shaped wound, and on each succeeding day tapping 6 in. lower until the base of the tree was reached; and in making a single V incision at 3 ft. from the ground and on each succeeding day reopening the wound by taking off a thin slice from the cut surface, thus taking advantage of what is termed the "wound effect" and economizing the tapping area. In one experiment 10 trees tapped according to the former method yielded 8.75 oz. of rubber in 4 days, and by the latter method 23.25 oz.

In another experiment 10 trees tapped each day with a V-shaped incision for 6 days yielded 56.75 oz. of rubber; while 10 others tapped but once with a V-shaped incision and the wound reopened each day during the same period, yielded 68.25 oz. of rubber. The experiments indicate, therefore, not only a greater amount of rubber by reopening the old wound, but a great economy in the tapping area of the tree.

Manuring Para rubber, H. N. Ridley (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 11, p. 351*).—The value of poudrette, lime, a mixture of burnt earth and decayed leaves, burnt earth, and cow dung, respectively, as manure for Para rubber seedlings was tested. The seedling beds were made on good low-lying soil. The plant height attained in each case with the different manures is tabulated. The most effective fertilizer was cow dung. Lime did not appear to be of much benefit. From the results obtained it is believed that cow dung may profitably be used in the nursery where Para rubber seedlings are grown.

Para rubber seed, F. J. Holloway (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 9, pp. 284, 285*).—The author states that he has tested the relative growth of a Para seed from tapped and untapped trees and can see absolutely no difference in the development of the respective seedlings. The opinion of Mr. Willis, Director of the Royal Botanic Gardens at Peradeniya, is also quoted to the same effect. Relative to tapping Para trees, experience gained in tapping 6,500 trees indicates that 1 lb. of rubber per tree can easily be obtained if the trees are tapped twice yearly.

Transplanting trees at night (*Gardening, 12 (1904), No. 279, p. 611*).—Some French experiments are cited in which large 5-year-old trees and over were successfully transplanted late in the season by planting at night, watering copiously, and wetting the branches which had young shoots 5 or 6 in. long. The transplanted trees thus treated showed almost no sign of check. Linden, walnut, grapes, and various other trees and shrubs were successfully transplanted in this manner. It is stated that the work is best done between 10 o'clock at night and 2 in the morning, and it

is desirable that the young shoots should have begun to be woody throughout half their length.

Crossing rhododendrons, O. SCHULZ (*Möller's Deut. Gärt. Ztg., 19 (1904), No. 23, pp. 271–273, figs. 4*).—*Rhododendron griffithi* was crossed with pollen from *R. arboreum hybridum* and a number of fertile seeds obtained. These germinated readily and made good plants, but it was 10 years before any of the seedlings thus obtained came into bloom. Part of the seedlings resembled the mother plant as regards flower and growth, and part the father. Illustrations are given showing the coloring and marking of some of the blooms obtained.

[New hybrid orchid] (*Gard. Chron., 3. ser., 35 (1904), No. 910, p. 360, fig. 1; Sup., pp. 1, 2*).—At the seventeenth annual exhibition of the Royal Horticultural Society of England, a hybrid orchid was exhibited by Mr. C. Vuylsteke, of Ghent, which is described as one of the most remarkable hybrids ever raised, and the most remarkable of recent years. It has been named *Odontioda* × *Vuylstekeæ* (*Cochlioda noetzliana* × *Odontoglossum pescatorei*).

The flowers resemble those of *O. pescatorei* in size and form, but with the thicker substance of the other parent and much of its reddish-orange color. "Sepals and petals broad and flatly displayed, reddish-orange on the inner two-thirds, the color having light irregular banding of white; margin of sepals and petals rose-colored; lip whitish with yellow crest; side lobes reddish-orange; front lobe spotted with red."

Manures for passion vines, J. TAYLOR (*Agr. Gaz. New South Wales, 15 (1904), No. 2, pp. 125–129*).—Manures were used according to 40 different formulas on passion vines. Some of the formulas used and the yields obtained are given. In general, manuring was found very beneficial and profitable, and complete manures gave better results than where any essential element was omitted.

FORESTRY.

The basket willow, W. F. HUBBARD (*U. S. Dept. Agr., Bureau of Forestry Bul. 46, pp. 100, pls. 7, figs. 27, map 1*).—This bulletin treats of the growing of basket willows, their preparation for use, injurious insects, and statistics of production and consumption. After tracing the general history of willow culture the author gives an account of the distribution and characteristics of the willow. The history of willow growing in the United States is outlined, and statements given regarding the present culture of osiers in this country.

Notes are given on the preparation of the holt or willow plantation, preliminary cultivation, planting, weeding and cultivation, cutting, drafting, and peeling. Suggestions are also given for improvements in culture whereby the quality of the product, as well as the yield, may be increased. The species of willow grown in the United States are said to be the Welsh or purple willow (*Salix purpurea*), the Lemley, patent Lemley or Caspian willow (*S. pruinosa acutifolia*), and varieties of the same, and the green or almond willow (*S. amygdalina*).

Tables are given showing the estimated expenditures and receipts from willows grown on upland and bottom lands. When grown upon upland an average net profit of $17.88 per acre for 14 years is estimated, while on the bottom lands subject to inundations the net return is estimated at $87.28 per acre for 12 years. An account is given of willow growing in Europe, in which considerable advance has been made in scientific willow culture, and certain facts are deduced which it is believed would be of value to the growers in this country.

Notes are given on the insects injurious to the basket willow. The bulletin concludes with statistics on the imports of raw and manufactured willow from 1855 to 1901, and also of the American production of willows and of willow basket ware.

The American forester at work, R. V. R. REYNOLDS (*Forestry and Irrig., 10 (1904), No. 5, pp. 204-213, figs. 8*).—An account is given of the forestry methods pursued by the members of the Bureau of Forestry of this Department, and the author claims that the work thus far carried on has shown the necessity for an American system of forestry based upon sound principles and a thorough knowledge of their local application. In this respect it will differ materially from forestry as pursued in Europe. European forests will offer abundant suggestions to the American forester, but they must be adapted to the local conditions present in this country. The different classes of work as subdivided in the Bureau of Forestry are briefly described.

Some practical notes on forestry, J. H. MAIDEN (*Agr. Gaz. New South Wales, 15 (1904), No. 5, pp. 442-444*).—Directions are given for the preparation of seed bed and sowing of seed for some of the more difficultly handled species of trees. The seed of a number of these species are said to germinate very slowly and to be favored by certain conditions which are described.

To facilitate transplanting and to insure against loss in some of the more tender species the author suggests the use of bamboo pots, which consist of bamboo cut into sections about 3 in. long. These are placed on end close together in the seed bed, covered with fine earth, and the seed thickly sown over them. In this way nearly every section of bamboo will have from 1 to 3 or 4 seedlings, and when the time for transplanting comes the weaker ones are removed and the better plants set in the ground in the pot. This soon decays and the young tree is not seriously affected by the removal from the seed bed. Where bamboo is not available, the author suggests the use of small flower pots or small tin cans in a similar way.

The raising of young trees from seed, T. R. SIM (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 2, pp. 129-146, figs. 8*).—Directions are given for collecting forest-tree seed and their preservation, preparation of seed beds and methods of sowing, care of the young seedlings, transplanting, etc.

The planting of trees, T. R. SIM (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 4, pp. 383-394, pl. 1, figs. 8*).—Directions are given for planting forest and ornamental trees.

Planting white pine (*Forestry and Irrig., 10 (1904), No. 6, pp. 264-267, figs. 2*).—A brief account is given of investigations carried on by the Bureau of Forestry, in which the planting of white pine in New England is shown to be commercially feasible. The information is based on U. S. Department of Agriculture, Bureau of Forestry Bulletin No. 45 (E. S. R., 16, p. 57).

Propagation of trees by means of cuttings, T. R. SIM (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 3, pp. 247-258, figs. 10*).—Directions are given for propagation of trees by means of cuttings. The different forms of cutting are described, and the results of this method of propagation, as put in practice, are shown.

While theoretically most species of trees can be propagated in this manner, yet in practice in Natal only a few can be propagated by hard-wood cuttings. Among those successfully propagated are the plane or sycamore, ash, cottonwood, Lombardy poplar, willows, white mulberry, catalpa, various species of elm, Spanish chestnut, and a number of hedge plants, such as privet, pomegranate, quince, etc. All attempts to propagate species of eucalypts, acacias, pines, cypress, maples, black locust, and honey locust have failed.

On the latest experiences as to heather plantations, C. DALGAS (*Hedeselsk. Tidsskr., 1904, No. 2-3, pp. 23-41*).—The author discusses in this paper the symbiosis between mountain pine and spruce, to which Mueller has called attention in his pamphlet On the Relation of Mountain Pine to Red Spruce in Jutland Heather Plantations, 1903 (Om Bjergfyrrens Forhold til Rödgranen i de jydske Hedekulturer, 1903), and illustrates this relation with a number of reproductions of photographs of forest plantations.—F. W. WOLL.

Reforesting the valley of the Rhone, H. Badoux (*Chron. Agr. Canton Vaud, 17 (1904), No. 7, pp. 247–249*).—An account is given of the reforesting of the Rhone Valley, the object being to break the force of the winds which sweep the valley, often causing serious injury to crops. The undertaking was the result of an agitation begun in 1890.

Plantings have been made at right angles to the axis of the valley at different distances throughout the canton. In all 68.5 hectares have been planted in 5 plantations varying in width from 50 to 100 m. In making these plantings 491,500 plants were used, 48 per cent of which were spruce, 18 per cent fir, 1.8 per cent pine, 24 per cent alder, 4.5 per cent oak, and the remainder ash, Canada poplar, and willows.

The total cost of the undertaking thus far has been $17,641, one-fourth of which was paid by the canton, about one-fourth by the general government, and the remainder charged to the various properties benefited.

The big trees and forest fires, G. F. Schwarz (*Forestry and Irrig., 10 (1904), No. 5, pp. 213, 214*).—Attention is called to the fact that the big trees of California, together with the nearly related redwood, are free from insect and fungus attacks to a very considerable degree. In addition the trees are protected to a great extent from forest fires by their thick spongy bark, which is free from pitch and not very combustible.

Although a large number of big trees have been severely burned about the base, their vitality has rarely been seriously affected. While they may not be physiologically injured, they are indirectly harmed by the change in mechanical conditions caused by large excavations at their bases. These excavations extend over a large part of the circumference, wounding the root system and rendering them liable to be overturned in severe storms.

The hardy catalpa as a farm crop, W. J. Green (*Ohio Sta. Bul. 149, pp. 69–80, figs. 8*).—Compiled notes are given on the characteristics and value of hardy catalpa, and the author gives directions for the collection of the seeds, sowing them, preparation of permanent plantations, planting, and subsequent care. This is preliminary to an extended investigation of this tree for forest planting. The station has begun growing trees for posts, poles, and railroad ties, and the intention is to extend the work so as to include a greater variety of forestry questions.

Forest thinning and its results, W. F. Hubbard (*Forestry and Irrig., 10 (1904), No. 6, pp. 268–271*).—This is the first of a series of papers by the author and deals with the theory and practice of thinning forests. The present paper gives the value and technique of thinning, being based on the practices followed in Europe.

The relation of forests to stream flow, J. W. Toumey (*U. S. Dept. Agr. Yearbook 1903, pp. 279–288*).—In this article the author considers a forest as an average growth of trees sufficiently dense to form a fairly unbroken canopy of tops and not a scattered growth of low, round-headed trees with bushes and herbage constituting a dominant type of vegetation.

The influence of such a forest on rainfall, evaporation, transpiration, the run-off of water, etc., is discussed, and in conclusion the author states that although "the forest may have, on the whole, but little appreciable effect in increasing the rainfall and the annual run-off, its economic importance in regulating the flow of streams is beyond computation.

"The great indirect value of the forest is the effect which it has in preventing wind and water erosion, thus allowing the soil on hills and mountains to remain where it is formed, and in other ways providing an adequate absorbing medium at the sources of the water courses of the country. It is the amount of water that passes into the soil, not the amount of rainfall, that makes a region garden or desert."

The reserve policy in operation, E. A. Braniff (*Forestry Quart., 2 (1904), No. 3, pp. 137–144*).—An attempt is made to show how the forest policy of the Government

is working out when put to test. The writer thinks the policy could be improved in several ways, the chief recommendations being in regard to the "lieu selections" of private and corporate lands included within the reserves and regarding the reserve management which he thinks should be turned over to the Bureau of Forestry of this Department.

The grazing problems, which at one time seemed of great importance, the writer believes are rapidly solving themselves, and so far as his observations go there is nothing in the forest policy which is unfriendly to the mining interests of the regions affected.

Forest problems of Michigan, J. H. BISSELL (*Forestry and Irrig., 10 (1904), No. 6, pp. 280, 281*).—A brief review is given of the former forest conditions of the State, contrasting them with the present condition.

From 50 to 55 per cent of the area of the entire State was originally in pine forest. The total production of pine for the State is said to have been 161,475,000,000 ft. B. M. This with the hard wood that has been lumbered represents a value of $2,649,175,000. Of the area cut over a great portion is said to be of little or no agricultural use, but is well adapted to the growing of white pine.

In order to secure the reforesting of these nonagricultural lands, the author makes a number of suggestions, among which are the repeal of all existing land laws, the acquiring by the State of all pine stump lands, the enactment of new land laws prohibiting the sale of public land except to actual homesteaders, and a policy of taxation which would encourage private owners in the improvement of their holdings.

Forest fires in Minnesota in 1903 (*Forestry and Irrig., 10 (1904), No. 6, pp. 285, 286*).—From an extract taken from the report of the chief fire warden of Minnesota it is shown that the number of forest fires reported upon in 1903 was 52, which burned over an area of 15,585 acres, causing a damage of $28,292. In addition 35 prairie fires were reported, which caused losses amounting to $4,666.

The various prosecutions that were brought under the law are briefly noted, and the cost of the enforcement of the law is shown. Appropriations for this purpose amounted during the year to $5,000, an amount which the fire warden shows is inadequate for the efficient execution of the law.

State forestry in Minnesota, C. C. ANDREWS (*Forestry and Irrig., 10 (1904), No. 5, pp. 228–230*).—An account is given of the State forestry in Minnesota and suggestions given for rendering it more extensive and efficient. For this purpose the author states that a sentiment for forest extension and preservation must be encouraged and sustained.

Forest legislation in New York (*Forestry and Irrig., 10 (1904), No. 6, pp. 273–278*).—A report is given of legislation recently enacted by the legislature of New York in which important amendments are made to the fire law; the boundaries of the Adirondack and Catskill parks are defined, and a proposed amendment to the State constitution is given by which it will become possible to secure the removal of the dead timber from State lands.

The forest interests of Ohio, W. R. LAZENBY (*Forestry and Irrig., 10 (1904), No. 5, pp. 227, 228*).—A brief account is given of proposed legislation for the State of Ohio, which is being urged by the Ohio State Forestry Society, assisted by others interested in the subject.

Some features of the Swiss forest service, A. CARY (*Forestry and Irrig., 10 (1904), No. 5, pp. 219–222*).—Some notes are given on the Swiss forestry service as it was observed by the author in a recent tour of that country. According to the report, 28 per cent of the area of the country is unproductive and 20 per cent is devoted to forestry. This area even under good management does not supply the needs of the country for timber and about $3,000,000 worth is annually imported, mostly from Austria and Germany.

A description is given of the forest system in which the relationship between the

federal government and the various cantons is shown in the forest code revised in 1902. The general oversight of all the forests within the limits of the country is given to the general government, whether the forests are the property of any public body or belong to individuals. To the cantons is left the regulation of the municipal woods and the control over private forests, subject to the veto of the federal regulations.

Among the striking regulations attention is called to the federal contribution to the salaries of the forest officers of the cantons, from 25 to 35 per cent of which are provided by the general government. In the protection work the federation may contribute from 50 to 80 per cent without sharing in the acquired title of reclaimed lands. In fire protection the government contributes half, and to the cost of the roads 20 per cent.

In this and many other ways the cooperation between the general government and the different divisions of the country is maintained. The efficiency of these methods of control varies in the different cantons as would naturally be expected.

The forests of the Hawaiian Islands, W. L. HALL (*Hawaiian Forester and Agr., 1 (1904), No. 4, pp. 84-102*).—A description is given of the forests in the Hawaiian Islands, particular attention being given to the algaroba (*Prosopis juliflora*). This species occurs near sea level and is said to have all sprung from a single tree which was introduced in 1837 and which still stands in Honolulu.

Some of the forest types occurring on the different islands are described, and notes given on some of the more important species. The causes of the rapid decline in the Hawaiian forests are said to have been overstocking, insect injury, rank growth of grasses following grazing, forest fires, and injudicious clearing.

Report of the chief of the forestry bureau, G. P. AHERN (*Ann. Rpt. Philippine Com., 1903, pt. 2, pp. 275-313, pls. 11, figs. 2*).—A report is given of the activity of the forestry bureau for the period from September 1, 1902, to August 31, 1903. A statement is given regarding the changes and present organization of the bureau, after which the work of the different divisions is reviewed at some length.

In the division of inspection the authorized force consisted at the time of the report of 4 inspectors, 20 assistant inspectors, and 128 rangers. The Philippine Islands have been divided into forest districts and at this time the number of stations was 55. Investigations of the division of forestry management are reviewed and descriptions given of some of the forests which have been under investigation. During the year covered by the report 2,430 applicants were granted licenses, an increase of 85 per cent over the number granted during the previous year.

A report is given of the investigations of the timber-testing laboratory and workshop, comparisons being given in tabular form of the results of crushing tests of a number of Philippine timbers and a number of United States species reported upon by the Bureau of Forestry of this Department.

One of the serious problems said to confront the forester of the Philippine Islands is the utilization of many of the unknown woods that grow on the islands. There are believed to be between 1,000 and 1,500 species of trees producing timber on the islands of which about 50 varieties make up 80 per cent of the timber in the market. An attempt is being made to find uses for other species in order to provide an outlet for additional kinds of timber. The author states that there have been registered in the forestry bureau 129 estates, embracing 106,647 hectares of private woodlands. The location and extent of these woodlands are shown.

A report is made on the amount of timber and forest products taken from public lands of the Philippines during the fiscal year, in which it appears that 4,740,738 cu. ft. of timber, 218,100 cu. ft. of firewood, and a large amount of miscellaneous products were collected during the year. In addition there was imported 113,483 cu. ft. of timber and 87,000 ft. B. M. were exported. A classification is given of the different varieties of timber cut, and tables are given showing the market price of timber, the receipts and expenditures of the bureau of forestry, etc.

Recommendations on policy, organization, and procedure for the Bureau of Forestry of the Philippine Islands, G. Pinchot (*Ann. Rpt. Philippine Com., 1903, pt. 2, pp. 315-325*).—A brief preliminary report is given in which recommendations are made on the organization and procedure of the bureau of forestry of the Philippine Islands, based upon the author's observations in a survey of the forests of the Philippine Islands.

Report on investigations made in Java, 1902, E. D. Merrill (*Philippine Dept. Int., Forestry Bureau Bul. 1, pp. 84, pls. 10*).—An account is given of a trip made by the author to Java in the interest of the Bureau of Forestry, descriptions given of a collection of plants that had been secured by the various field parties of the Forestry Bureau, the methods of investigating forest flora of Java are described, and notes given on the Botanical Institute at Buitenzorg.

A new hypsometer, H. D. Tieman (*Forestry Quart., 2 (1904), No. 3, pp. 145-147, pl. 1*).—A description is given of a new form of hypsometer which is believed to be an improvement on the existing forms in a number of ways. This instrument, which is used for ascertaining the height of trees, etc., makes use of a new principle in that it brings 2 points, the vertical distance between which is to be measured, and the scale rod into single parallax by means of a rotary mirror. The readings are taken very rapidly since only one sighting is necessary and the height of the tree is read off directly.

A method of timber estimating, C. Leavitt (*Forestry Quart., 2 (1904), No. 3, pp. 161-163*).—A brief description is given of a method of estimating standing timber which is said to be in actual use. This is adapted to the use of the cruiser accompanied by a compass-man. The method described is adapted to tracts of any size and by it the timber on a quarter of a section may be estimated in a single day.

The preservative treatment of wood, S. P. Sadtler (*Tech. Quart., 17 (1904), No. 2, pp. 129-144, figs. 3*).—This paper reviews the history of the development of methods of preservative treatment of wood, especial attention being given to the apparatus and methods used in impregnating wood with aluminum sulphate and ferrous sulphate made slightly basic by previous treatment with alkali, according to the Ferrell process.

Recent progress in timber preservation, H. von Schrenk (*U. S. Dept. Agr. Yearbook 1903, pp. 427-440, pls. 3, figs. 3*).—According to the author, considerable interest has been recently manifested throughout the United States on the subject of timber preservation. Directions are given for the preparation of various woods for chemical treatment, and some of the more common methods are described.

Notes are given on the cost and relative efficiency of different treatments, and the author states that it is more profitable to treat inferior cheap timbers, such as the loblolly pine and red oak, than the longleaf pine and white oak, as the latter timbers take treatment very poorly. All timber should be thoroughly seasoned before being treated, as seasoned timbers not only take treatment better and consequently have a longer period of usefulness, but are easier handled.

For the present he recommends the following preservatives: For fence posts, either charred or treated when absolutely dry with carbolineum, spirittine, or tar oil. They may also be soaked in corrosive sublimate. Telephone and telegraph poles may be treated in a like manner. For structural timbers, creosote treatment, using 10 lbs. of tar oil per cu. ft., is recommended. For railroad ties, treating with creosote, zinc chlorid, and zinc chlorid and tar oil is recommended. For piling, the tar-oil treatment is to be preferred.

SEEDS—WEEDS.

The vitality and germination of seeds, J. W. T. Duvel (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 58, pp. 96, figs. 2*).—This paper treats chiefly of the conditions influencing the vitality and germination of seeds when subjected to such methods of treatment as are met with in the ordinary handling of seeds, particular

attention being paid to the effect of climate, moisture, and temperature on vitality. A discussion is given of the respiratory activities of seeds and the part played by enzyms.

In the investigations the author employed sweet corn, onion, cabbage, radish, carrot, pea, bean, pansy, phlox, tomato, watermelon, and lettuce seed. These were given a preliminary test, after which the effect of climatic conditions and of moisture and temperature were investigated. Samples of seed from the same lots were distributed to be tested under what are known as trade conditions, dry-room, and basement conditions in Porto Rico, Florida, 2 stations in Alabama, Louisiana, Indian Territory, New Hampshire, and Ann Arbor, Mich. After intervals of 128 and 251 days lots of the seed were returned for testing. They were germinated as speedily as possible and the results are given in tabular form.

Marked differences were shown in the depreciation of the vitality in the different lots as reported. It was observed that there was a close relationship between the precipitation and the loss in vitality, the deterioration in vitality being directly proportional to the total annual rainfall. The effect of moisture and temperature was studied, and it was found that most seeds if kept dry were not injured by prolonged exposures to temperatures below 37° C., it being immaterial whether the seeds were in open or in sealed bottles. If the temperature was increased beyond 37° C. the vitality was seriously affected. Seeds kept in a moist atmosphere at temperatures as high as 30° C. were considerably injured within a short period of time, and the degree of injury rises rapidly with the increase in temperature. With the same degree of saturation, the deleterious effect of moisture was as great with samples kept in open as in closed bottles.

The effect of definite quantities of moisture on the vitality of seeds when kept within certain known limits of temperature was studied, and a marked decrease in the number of germinable seeds was observed with an increase in the moisture and temperature.

A comparison was made of the methods of storing and shipping seeds in order to protect them from moisture and consequently to secure a better preservation of vitality. An attempt was made to ascertain how small quantities of seed should be packed to retain a maximum germinative energy for the longest time, what immediate external conditions are best suited to the longevity of seeds, and the effect of climatic conditions on the life of the seeds. In the first experiment duplicate samples of various kinds of seed were put up in double manila coin envelopes and in small bottles, some of the bottles being filled, others only partly full. In order to determine the immediate effect of external conditions different lots of seed were subjected to trade conditions, dry rooms, and basements, these conditions representing the usual methods of seed storage.

Samples were distributed as mentioned before and it was found that different seeds behaved very differently under identical conditions. The relative value of different methods of storing seeds in paper packets is shown by the average losses of vitality, as reported from the 8 different stations. The depreciation for trade conditions was 36.63 per cent, for dry rooms 21.19 per cent, and for basements 42.28 per cent. Comparing these general averages with the averages given from the bottle samples, it is seen that the loss for those kept in bottles was for trade conditions 3.93 per cent, dry rooms 8.08 per cent, and basements 4.51 per cent. Experiments are reported on keeping and shipping seeds in special packages in which the envelopes and bottles mentioned above were sealed with paraffin, etc. The result obtained showed decidedly in favor of protecting seeds in moist climates from the action of the atmosphere.

The author gives a discussion of the respiration of seeds and the action of enzyms in the preservation of vitality, after which he summarizes his investigations, concluding that "the life of a seed is undoubtedly dependent on many factors, but the

one important factor governing the longevity of good seed is dryness." A considerable bibliography of literature is given.

Seed testing for farmers, B. O. LONGYEAR (*Michigan Sta. Bul. 212, pp. 11, figs. 30*).—Popular directions are given for the examination of seed for impurities and testing them for their germinative ability, as well as descriptions and notes on the more common weed seed found in examining alfalfa and various clover seeds.

Trifolium incarnatum, D. FINLAYSON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 5, pp. 8, figs. 7*).—A discussion is given of the crimson clover (*T. incarnatum*) in which its value for renovating lands for hay crop, etc., is shown. Attention is called to the necessity of early cutting in case it is used as a hay crop, since the abundant hairs result in the formation of balls in the intestines of animals, frequently causing death. A description is given of the seeds of crimson clover, and the average purity and germination of a good quality of commercial seed are given. Illustrated notes are also given of the more common weed seeds which are met with as impurities in samples of clover seed.

Rice weeds in Louisiana, W. R. DODSON (*Louisiana Stas. Bul. 77, 2. ser., pp. 394–429, figs. 14*).—This bulletin describes and illustrates the more important weeds growing in the rice fields of Louisiana and gives suggestions for their destruction. It is, in a way, a continuation of a previous publication on this subject (E. S. R., 12, p. 760). A number of new weeds are described, and additional points in the eradication of others have been developed, so that this publication will take the place of the previous one.

Charlock spraying (*Jour. Bd. Agr. [London], 11 (1904), No. 3, pp. 155, 156*).—A brief summary is given of investigations carried on in 1902–3 with charlock spraying on 24 farms in the various counties in the south of Scotland. Altogether several hundred acres were sprayed, the herbicide used being a 3 per cent solution of copper sulphate at the rate of 50 gal. per acre.

It was found that one spraying under favorable circumstances would kill the charlock, but this was dependent on proper application under suitable climatic conditions. In many instances two applications at intervals of 10 days were required to completely eradicate the weed from growing cereals. There was found no necessary relation between the size of the plant and the stage when it could be most easily destroyed. In cold, backward seasons and on exposed land the charlock frequentyl comes into flower when less than 3 in. in height. Such plants are usually of slow growth, stunted, and are much more difficult to kill than when the plant is young and succulent. In cases of this kind it was found desirable to use a 4 per cent instead of a 3 per cent solution.

The destruction of wild mustard, H. HITIER (*Jour. Agr. Prat., n. ser., 7 (1904), No. 16, pp. 510, 511*).—In response to many inquiries regarding the efficiency of chemicals for the destruction of wild mustard, the author summarizes the claims put forth for different herbicides. He describes the method of preparation and application of solutions of copper sulphate, copper nitrate, iron sulphate, and iron-sulphate powder.

The time for applying the different chemicals is given, and their efficiency not only toward the wild mustard but other weeds is shown. The amount of injury which any of these chemicals produce on cereals, clover, alfalfa, etc., is said to be small. While these chemicals are claimed to be efficient for the destruction of wild mustard, the average cost is said to be rather excessive, being from $2 to $3 per acre.

A new method for the destruction of mustard, L. CAZAUX (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 18, pp. 556, 557*).—An account is given of the use of finely powdered iron sulphate spread upon the field at the rate of 200 to 300 kg. per hectare. This treatment was quite efficient in destroying the mustard and was without injury to the crops, which were barley and oats.

DISEASES OF PLANTS.

The origin of parasitism in fungi (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 3, pp. 152–154*).—An abstract is given of a paper by George Massee, in the *Philosophical Transactions of the Royal Society of London*, on parasitism in fungi.

It is said that the author has brought to light some of the factors which determine immunity of certain species of plants and individuals to the attack of specific fungi. The investigations seem to show that small differences in the character of the sap of the plants are probably the main determining causes as to whether the fungus shall be able to gain entrance into a plant. As a general rule it was found that, if a weak solution of sugar was introduced within a leaf and spores of any of the commoner parasitic fungi placed on the treated portion of the leaf, the fungus could penetrate and live on the sugar solution, eventually attacking the adjoining tissues. If, on the other hand, a weak solution of acids was introduced the fungus, as a rule, showed no disposition to enter.

The investigator seems to have been able to cause certain saprophytic fungi to attack living plants, and he concludes that all parasites have developed from saprophytes, and it is possible for almost any fungus living on dead vegetable matter to acquire the habit of parasitism. He cites as an illustration the fungus *Dendryphium comosum*, which until recently had not been reported as attacking living plants, but by the aid of unnatural conditions produced under glass houses has been found attacking young cucumbers in a very serious manner.

Recent observations on the loose smut of cereals, E. SCHRIBAUX (*Jour. Agr. Prat., n. ser., 7* (*1904*), *No. 15, pp. 479–482*).—A discussion is given of the biology of the loose smuts of cereals, and also the results of the author's observations. He states that the smuts penetrate the wheat plant at 2 different periods, first during germination and second during the flowering season. The infection during the flowering season is not manifested until the following year. This form of infection is what is called the internal, while the infection which takes place during germination is called external infection.

For the internal infection the hot-water treatment is said to be the only efficient means, while for preventing external infection other methods are equally as good. The spores of the smut found within the seed are less dangerous to the general crop than those adhering to it, and in cereals where the glumes remained closed, or open for a very short time, the chances for infection are rather remote. This is particularly true if flowering takes place during a period of cool weather.

Treating seed grain to prevent smut, H. O. JACOBSON ET AL. (*Rpt. Wisconsin Agr. Expt. Assoc., 1904, pp. 62–66*).—The results of treating oats with formaldehyde solutions for the prevention of smut are shown by the experience of a number of experimenters in different parts of the State. The directions given in Wisconsin Station Bulletin 98 (E. S. R., 14, p. 978) were followed in all essential details, and all the investigators report a greatly lessened amount of smut and greater yields from treated seed when comparisons were made with small areas grown from untreated seed.

Black scab of potatoes (*Bd. Agr. and Fisheries* [*London*], *Leaflet 105, pp. 4, figs. 2*).—A brief popular account is given of the black scab of potatoes (*Œdomyces leproides*), which was first reported in England in the autumn of 1900, having probably been brought to that country with potatoes imported from the Continent.

This disease, which has been previously described (E. S. R., 14, p. 1085), is characterized by the abnormal growth of the tissues about the infected portions of the tuber. The fungus seems to stimulate a rapid growth, resulting in the formation of large, irregular-shaped outgrowths of a blackish color. When potatoes are planted in soil containing the fungus the young sprouts are often attacked and their further

growth checked. It is known that the organism survives in the soil for at least 2 years and that beets and mangels are subject to attacks of the same organism, consequently, in rotation these crops should be omitted.

Rolling the tubers in sulphur and treating the infected soil with the same fungicide have given results that fully repaid the cost of material and labor. The application of quicklime, while effective, has not been as efficient as powdered sulphur. Gas lime and winter plowing have been practically useless as means of combating this disease.

Some diseases of cane specially considered in relation to the leaf-hopper pest, and to the stripping of cane, R. C. L. PERKINS (*Hawaiian Forester and Agr., 1 (1904), No. 4, pp. 80–84*).—The relation between the pineapple disease in its various forms and the injury produced by leaf-hoppers, etc., is pointed out, and notes are given on other diseases of cane in which there appears to be no connection between the disease and insect attacks.

Onion blight, H. H. WHETZEL (*New York Cornell Sta. Bul. 218, pp. 139–161, figs. 17*).—In 1903 a serious outbreak of onion blight or mildew caused by *Peronospora schleideniana* was reported. The disease seemed to spread from definite spots in the onion field where first noticed, and later investigations showed that it was rather generally distributed throughout the principal onion-growing districts of the State. The attack was so severe as to materially reduce the crop, and inquiries brought out the fact that it was prevalent the previous year and probably other years, but the fungus made its appearance so late in the season as to do comparatively little injury.

The present report is a preliminary one, designed to interest onion growers and gardeners in checking the disease, and is to be followed by investigations of the nature and control of this disease. For the prevention of the disease it is recommended that the plants be sprayed with Bordeaux mixture, attention paid to the location and drainage of the land, and raking and burning of tops after harvesting, and although there is considered little danger of distributing the disease through the seed the author recommends soaking them for 30 minutes or more in a 0.5 per cent solution of formaldehyde before sowing.

A technical account is given of the fungus causing the blight, and brief notes are given of a secondary fungus (*Macrosporium parasiticum*), which blackens the bulbs and is associated with the blight. Notes are also given on injury by onion maggot, onion thrips, and a disease known as white tips, the nature of which is not definitely known.

A new eggplant fungus, C. O. SMITH (*Jour. Mycol., 10 (1904), No. 71, pp. 98, 99, figs. 6*).—In the autumn of 1903 the author observed a disease of eggplant which proved to be new to Delaware. At first it was thought to be caused by the spot fungus (*Phyllosticta hortorum*), but subsequent investigations showed that this was not the case. The fungus producing the disease agrees so closely with *Ascochyta lycopersici* that in the absence of authentic specimens it has been referred to that species.

Inoculation experiments with pure cultures have demonstrated that this fungus is parasitic on eggplant, tomato, horse nettle, and Jamestown weed. A technical description of the organism is given.

Vitality of Pseudomonas campestris on cabbage seed, H. A. HARDING and F. C. STEWART (*Science, n. ser., 20 (1904), No. 497, pp. 55, 56*).—Investigations are reported in which it is stated that the organism causing black rot of cabbage may live on dry cabbage seed for at least 10 months.

In the experiment reported cabbage seed was wet with water into which a culture of *P. campestris* had been thoroughly stirred. The seed was then dried and stored in test tubes, some of which were plugged with cotton and others were plugged with cotton and then sealed with paraffin. Once a month the seeds were tested for the presence of living germs, and although the experiment was unfinished at the end of 10 months living germs were found both in the paraffined and unparaffined tubes,

and healthy cabbage plants inoculated with these germs showed the presence of black rot in from 1 to 3 weeks.

It was also shown that seed produced by cabbage plants infected with black rot are able to carry the organism and infect seedling plants. The details of this investigation are to be published in a forthcoming bulletin of the New York State Station.

Peach diseases, III, A. D. SELBY (*Ohio Sta. Bul. 148, pp. 55-67, pls. 7*).—This bulletin gives notes on the prevalence, surrounding conditions, and methods employed for the prevention of leaf curl and scab of the peach during recent years in Ohio, and is in continuation of notes previously given (E. S. R., 10, p. 557; 11, p. 357).

The occurrence and distribution of the leaf curl in northern Ohio for the past 11 years is traced, and an attempt made to correlate the occurrence of the disease with weather conditions. It is stated that the leaf curl was prevalent during seasons of frequent rainy days in April, May, and June. When these months were warm and fairly bright the amount of leaf curl was greatly reduced. Spraying the trees with a single application of Bordeaux mixture before the opening of the blossoms proved effective for the prevention of leaf curl, and where fungus diseases only are to be combated Bordeaux mixture is to be preferred. Where it is desired to treat the trees simultaneously for leaf curl and scale insects some of the sulphur sprays are recommended.

The results of 7 years' study of the prevalence and injury of the fruit spot or scab fungus confirm the popular opinion that this fungus is influenced in its development by the amount of rainy weather in the late summer and early fall. The severe losses that frequently follow the presence of this fungus may be largely prevented by the proper use of fungicides, and in addition to 1 spraying before the blooming period recent observations indicate that 2 applications of weak Bordeaux mixture, one about June 15 and the second 3 or 4 weeks later, will largely or entirely prevent the occurrence of scab.

Crown gall, J. B. S. NORTON (*Maryland Sta. Circ. Bul. 56, 2. ed., pp. 8, pls. 6*).—The attention of growers is called to some of the principal characteristics of the crown gall and hairy root, which are considered by some to be forms of the same disease. According to the author, the nurseries of the State, which are subject to regular inspection, are practically free from crown gall, and nurserymen are especially careful to discard infected stock when shipping. Care in the selection of stock and the use of resistant strains where known are recommended as preventive measures.

A note on the collar rot of the orange, R. A. DAVIS (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 133, 134, pl. 1*).—The author shows that the collar rot of the orange has been present in the Transvaal for a considerable time, in spite of the frequent assertion that the disease does not exist in that region.

The usual method of irrigating the orange, which consists of the formation and filling of a basin around the trunk of the tree, is held to be partially responsible for the presence of the disease. Fully nine-tenths of the orange trees are said to be suffering from the application of water around the trunks. This with the improper drainage frequently leads to disease. Where the trees have become badly infested the author recommends total destruction, but where only slightly affected it is recommended that the bark be cut away from about the spots, leaving the wood exposed for several days. If no exudation of gum be observed it may be considered that the disease has been removed and the wounds should be protected by a coating of some fungicide. So far as practicable the use of resistant stock for grafting and budding is suggested.

The sooty mold of the olive, ZACHAREWICZ (*Bul. Dir. Agr. et Com. [Tunis], 9 (1904), No. 31, pp. 208-211*).—The sooty mold of the olive, according to the author, is due to the fungus *Fumago salicina*, which develops over various portions of the tree as a black coating, from whence it gets its name. It follows the *Lecanium oleæ*.

Associated with it is another fungus (*Cycloconium oleaginum*). For combating these 2 diseases the author recommends treating the olive trees with a mixture composed of soap 1 kg., kerosene 4 liters, copper sulphate 1 kg., and water to make 100 liters. Directions are given for the preparation of this compound insecticide and fungicide, and notes are given on its efficiency, cost, etc.

The sooty mold of the olive, CHAPELLE (*Bul. Dir. Agr. et Com.* [*Tunis*], *9* (*1904*), *No. 31, p. 223*).—The author reports a successful treatment of olive trees for protection against sooty mold by spraying them with a strong Bordeaux mixture to which was added "Nicotine." This was sprayed over the trees 3 times during the season, and is said to have been very efficient in removing the fungus.

A new species of fungus-producing canker on cacao trees, A. HEMPEL (*Bol. Agr. São Paulo, 5. ser., 1904, No. 1, pp. 22–24*).—A technical description is given of *Colonectria bahiensis*, a new species of fungus which has been recently recognized in Bahia, Brazil, as parasitic on the trunk of the cacao tree. In addition to this species brief notes are given on *C. flavida*, which occurs in Trinidad and other portions of the West Indies, and on *Nectria theobromæ*, both of which are quite injurious to cacao cultivation.

A new method for the treatment of black rot, J. DUCOS (*Prog. Agr. et Vit.* (*Ed. L'Est*), *25* (*1904*), *No. 27, pp. 11–13*).—An account is given of a preventive treatment of grapes against the black-rot fungus. The author has for a number of years been pursuing a plan which, in brief, consists of spraying the vines at the time when the fungus is making its successive appearances.

In order to determine the time for spraying a few plants are left unsprayed, and whenever the spots caused by the fungus are observed on the leaves the other vines are thoroughly sprayed with a rather strong Bordeaux mixture. As a preliminary to the treatment of the vines, they are given 2 sprayings with either copper sulphate or strong Bordeaux mixture before the appearance of the leaves. In this way the author claims to have prevented attacks of black rot with 5 sprayings in 1902 and 4 in 1903.

The treatment is said to have also been efficient in preventing the occurrence of the downy mildew.

The occurrence of black rot in Marmandais, A. GUY (*Prog. Agr. et Vit.* (*Ed. L'Est*), *25* (*1904*), *No. 22, pp. 663–665*).—A report is given of investigations on the dates of appearance of the black-rot fungus in the vineyards of Marmandais. Various dates are cited as to the time of the first observation of the fungus, and data are given regarding the time of first applications of fungicides for the protection of the vines from this disease.

The first application of fungicides should be made between April 26 and May 2. The example is cited of a vineyard in which an early spraying was given, followed by other applications during the season at intervals of about 8 days, resulting in almost total absence of the disease.

The treatment of chlorosis of grapes in calcareous soils, L. VERNET (*Prog. Agr. et Vit.* (*Ed. L'Est*), *25* (*1904*), *No. 13, pp. 385, 386*).—The usual treatment for chlorosis by which iron sulphate is added to the soil is said to be most too slow in its action, and the author proposes a treatment in which there is combined action of the iron salt and a decalcification of the soil.

The method of treatment described consists of the addition of 10 kg. of commercial sulphuric acid to about 160 liters of water, and to this is added 10 kg. of sulphate of iron, which is suspended at the surface of the liquid and gradually dissolved. After solution and thorough mixing this is poured about the vines at the rate of about 2 liters to each vine, care being taken to bank up the earth about the grape vine to protect it from direct injury.

The treatment of gray rot of grapes by hydraulic lime, G. MARAIS (*Prog. Agr. et Vit.* (*Ed. L'Est*), *25* (*1904*), *No. 24, p. 704*).—The author reports having suc-

cessfully combated the gray rot of grapes due to *Botrytis cinerea* by heavy applications of powdered hydraulic lime to the vines.

Treatment for control of gray rot of grapes, E. ZACHAREWICZ (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 22, pp. 651–655, pl. 1*).—The author claims that by treating vines with a solution of copper sulphate, powdered soap, and water, followed with applications of sulphur and sulphosteatite or plaster, powdered soap, and sulphosteatite it is possible to prevent injury to grapes by *Botrytis cinerea*.

In an editorial note a doubt is expressed regarding the efficiency of the present fungicides and mixtures for the control of this disease.

The brunissure of the grape, L. RAVAZ (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 3, pp. 69–72, figs. 6*).—The author briefly describes the brunissure of the grape, which he holds is not of fungus or bacterial origin, but is due to a weakened condition of the plant resulting from overbearing.

Notes on verdigris in combating grape mildew, E. CHUARD and C. DUSSERRE (*Chron. Agr. Canton Vaud, 17 (1904), No. 9, pp. 291–297*).—Studies are given of the relative value of 2 forms of verdigris which are in common use as fungicides for use in preventing grape mildew. One, which is called neutral or refined verdigris, contains from 31 to 32 per cent copper and is distinguished by its ready solubility in water, while the second form, known as basic or adherent verdigris, is less soluble in water and remains in suspension for a considerable time. It is less rich in copper, containing only 23 or 24 per cent on an average.

The experiments conducted with these fungicides showed that the soluble verdigris was more easy of application, did not present any visible traces after some little time, nor was it washed off by rains if the treatment was given the vines at a time when they were completely dry. A 0.5 per cent solution gave results as satisfactory as when a more concentrated form was employed.

The results of an investigation with grape mildew and its treatment in 1903, E. CHUARD and H. FAES (*Chron. Agr. Canton Vaud, 17 (1904), No. 8, Sup., pp. 51*).—The results of an investigation into the mildew of grapes, times of its invasion in different regions, methods of treatment and their results, and conclusions regarding this disease are given.

Much of the information published is based on returns received from circular letters sent out to correspondents throughout every grape region of Switzerland. Formulas for the preparation of fungicides and directions for application are given, and it is concluded that the proper use of fungicides, even in years when mildew is very prevalent, reduces the amount of injury to a great extent.

The wintering of the powdery mildew of the grape, G. DE ISTVANFFI (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 6, pp. 130–132*).—The importance of determining the method by which the powdery mildew is carried over from one season to another has led to numerous investigations.

In Europe this fungus seldom produces the perithecial form and consequently must have some other method of propagation. The author reports having observed in October the mycelium of the fungus as well as its conidial stage on buds which were produced on late shoots. The microscopical examination of the tissues of these buds showed that the fungus had penetrated them and fructified. Cuttings of vines attacked by the mildew in autumn were collected through the winter which showed a presence of the mycelium in considerable quantity. A third method of spending the winter is said to be on the dried clusters of grapes remaining on the vines. An examination made in January and February showed the mycelium quite abundant.

Based upon the author's investigations, he recommends for the destruction of this fungus winter treatment of vines and the collection of all dried clusters, etc.

Occurrence and treatment of grape powdery mildew, L. RAVAZ (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 22, pp. 645–651*).—The author reviews the recent publications of Istvanffi (see above) regarding the method by which the grape pow-

dery mildew is carried over in its conidial phase from season to season, and gives the results of some of his own observations upon the subject.

As far as the author's information goes, he has never been able to find any conidia of the fungus on the shoots or bark, although they have been more or less covered with the mycelium. The buds seem to be a common abiding place for the fungus during the winter time and the disease is frequently first observed upon the stipules.

In attempting to combat this disease the author states that the reason why some fungicides are not efficient is that they do not thoroughly wet the plant. On this account Bordeaux mixture and some of the more adhesive fungicides are inadequate, but if the leaves and bunches of fruit are thoroughly wet with a fungicide it is possible to control the mildew.

On the simultaneous treatment of the powdery and downy mildew, E. CHUARD and C. DUSSERRE (*Chron. Agr. Canton Vaud, 17 (1904), No. 11, pp. 329–332*).—Spraying grapevines with a fungicide composed of Bordeaux mixture to which is added a form of sulphur, which the authors state is easily wet with water, is recommended as a treatment for the prevention of both the powdery and downy mildew.

This form of sulphur is said to be in the market in 2 qualities, one, which is used as a simple mixture and is applied at the rate of 1 to 3 kg. per 100 liters of Bordeaux mixture, and a second, which contains a portion of carbonate of soda. It is also said that the sulphur may be used with Burgundy mixture, verdigris solutions, etc.

Destruction of grape buds by copper sulphate, L. VERNET (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 15, pp. 467, 468*).—In order to protect grapes against late spring frosts it is a common practice to cover them with screens of coarse bagging. These are very commonly dipped in a 5 per cent solution of copper sulphate to protect them against mildew, etc., and prolong their durability.

The author states that dew and rain falling upon the screens cause the copper sulphate to go into solution and drop through upon the vines, frequently burning and destroying the buds. In order to prevent this injury he recommends soaking the screens in eau celeste. Rain or dew falling upon this does not make as injurious a fungicide and at the same time the screens protect the buds.

A disease of coniferous trees, P. VAN BIERVLIET (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 4, pp. 166–168*).—An account is given of attacks on spruce, silver fir, and other coniferous trees by *Botrytis douglasii.* As a preventive measure the author recommends the burning of the diseased trees, and where possible spraying with a fungicide composed of copper sulphate 900 gm., copper carbonate 1,360 gm., potassium permanganate 85 gm., soft soap 225 gm., and rain water 80 liters.

Two fungi growing in holes made by wood-boring insects, P. SPAULDING (*Missouri Bot. Garden Rpt. 1904, pp. 73–77, pls. 3*).—An account is given of 2 species of fleshy fungi which were observed in the long-leaf pine district of eastern Texas in a region where *Pinus palustris* is exclusively cut for timber. After lumbering, the tops and small logs are left on the ground to rot and this material is the home of a great number of wood-boring insects; one species in particular is very abundant, making a hole about ¼ in. in diameter. On many small logs were found fungi of the Agaricus type, and upon being submitted to Prof. Charles H. Peck they were identified as *Flammula sapineus* and *Claudopus nidulans.*

The fungus mycelium was found in every instance to extend but a short distance into the portions which were filled with a mass of wood fiber which had been chewed up by the borer. The mycelium was found only in the somewhat decayed material in the burrows and apparently never entered into the wood which bounds the opening left by the grub. Similar instances are sighted of other fungi which are associated with bark-boring and other insects.

Revised plant import regulations, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 702–707*).—After calling attention to the necessity for the inspection of nursery stock and the dangers from the introduction of diseases, the author

gives the regulations under which plants may be introduced into South Africa, discussing them at some length.

Preparation and use of fungicides (*Chron. Agr. Canton Vaud, 17 (1904), No. 10, pp. 311–315*).—Directions are given for the preparation of Bordeaux mixture, Burgundy mixture, and neutral and adherent verdigris, the quantity of each fungicide to be used, time for its application, etc., being indicated.

ENTOMOLOGY.

The attraction of colors and odors for insects, J. Pérez (*Mem. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 3 (1903), pp. 1–36*).—Observations were made on honeybees, bumblebees, syrphus flies, and many other insects for the purpose of determining the influence of the odor and color of flowers upon the visitation of insects. It was found that bees do not always confine themselves to any one species of plant during a given flight. Such is the case especially when pollen is being collected. In Hymenoptera other than bees, it was observed that the insects confined their attention largely to one family of plants.

Injurious insects, E. Fleutiaux (*Agr. Prat. Pays Chauds, 3 (1903), Nos. 14, pp. 241–252; 15, pp. 372–376; 3 (1904), Nos. 16, pp. 495–502; 17, pp. 623–627, figs. 6*).—Descriptive and economic notes are given on various insects injurious to sweet potatoes, cassava, chickpea, beans, sorghum, cocoanut, cacao, banana, and other tropical plants.

Insects injurious to cultivated plants, F. Corboz (*Chron. Agr. Canton Vaud, 17 (1904), No. 11, pp. 338–341*).—Notes on the injurious effects and means of combating brown-tail moth, *Cossus ligniperda*, *Hybernia defoliaria*, *Agrotis segetum*, etc.

Insect injuries to hardwood forest trees, A. D. Hopkins (*U. S. Dept. Agr. Yearbook 1903, pp. 313–328, pl. 1, figs. 17*).—The author discusses the habits, life history, and means of combating a number of the most important insect enemies of hardwood trees. The hickory-bark beetle may be controlled by cutting and burning the bark of infested trees before the middle of May of each season. The oak-bark beetle is to be controlled by felling infested trees, removing the bark from the trunks, and burning the branches. Notes are also given on cherry-bark beetle, two-lined chestnut borer, oak-timber worm, carpenter worm, etc.

Powder-post injury to seasoned wood products, A. D. Hopkins (*U. S. Dept. Agr., Division of Entomology Circ. 55, pp. 5*).—The character of the injury caused by so-called powder-post beetles and the extent of losses thus produced are briefly described. The damage of this sort is caused by several species of insects which burrow in seasoned wood. In general the winter is passed in the dry wood. The eggs are deposited in the spring and the larvæ begin work at once. Sapwood which has been stored in one place for 2 or more years and manufactured wood articles are most frequently injured.

In preventing losses from these pests it is recommended that infested pieces of wood and lumber be destroyed or treated with kerosene, or by steaming or subjection to dry heat. It is also suggested that lumber yards be frequently inspected to detect the presence of the insect.

Catalogue of exhibits of insect enemies of forests and forest products at Louisiana Purchase Exposition, St. Louis, Mo., 1904, A. D. Hopkins (*U. S. Dept. Agr., Division of Entomology Bul. 48, pp. 56, pls. 22*).—The object of the exhibit is to show the most important forest insects and the nature of their injuries to trees and woods. The exhibit is classified according to geographical distribution and systematic position of the host plants and insects.

Some insects that attack fruit trees in the spring, T. B. Symons (*Maryland Sta. Circ. Bul. 57, pp. 8, figs. 9*).—Attention is called to the necessity of making careful observations in the spring in order to prevent the ravages of injurious insects

upon fruit trees. Notes are given on the appearance, habits, life history, and means of combating apple aphis, codling moth, tent caterpillar, plum curculio, fruit-tree bark-beetle, flat-headed apple-tree borer, and peach-tree borer.

Report of the State entomologist, R. A. Cooley (*Montana Sta. Bul. 51, pp. 199–274, pls. 8, figs. 10*).—Detailed notes are presented on the appearance, habits, life history, distribution, natural enemies, and means of combating the most important species of injurious insects in Montana, including bud moth, oyster-shell bark-louse, apple aphis, flat-headed apple-tree borer, pear-leaf blister-mite, and grasshoppers. The author discusses also the economic value of toads and presents a brief list of Montana fruit pests with notes on insecticides and fungicides.

Bulletin of the commission of agricultural parasitology (*Bol. Com. Par. Agr., 2 (1904), No. 4, pp. 143–206, pls. 9, fig. 1*).—Biological and economic notes are presented on various injurious insects of grapes and other crops, protection of insectivorous birds, cotton-boll weevil, pyrethrum insect powder, etc.

The status of the Mexican cotton-boll weevil in the United States in 1903, W. D. Hunter (*U. S. Dept. Agr. Yearbook 1903, pp. 205–214, pls. 5, fig. 1*).—A brief account of the distribution, depredation, life history, and means of controlling this pest.

The author believes that no direct insecticide methods such as the use of poisons will be effective in destroying the pest. Neither is any hope entertained of great help from the use of fungus diseases or resistant varieties of cotton. Apparently the greatest reliance must be placed in proper cultural methods such as the early destruction of plants in the fall and hastening the maturity of the crop in order to avoid the attacks of the weevils.

The Mexican cotton-boll weevil, H. A. Morgan (*Proc. Louisiana State Agr. Soc. and Stockbreeders' Assoc., 1904, pp. 64–71*).—The conditions of the weevil problem in Texas and Louisiana are briefly outlined. The habits, life history, distribution, and means of combating the pest are also discussed.

An enemy of the cotton-boll weevil, O. F. Cook (*U. S. Dept. Agr. Rpt. 78, pp. 7*).—While studying the varieties of cotton grown by Indians in Guatemala, the author discovered that a large reddish-brown ant which normally visits the cotton plants for the purpose of feeding upon the nectar secreted by the leaves and other parts of the plant also attacks the cotton-boll weevil and destroys it by stinging and injecting a poisonous substance.

The author believes that the successful cultivation of cotton by the Indians of Alta Vera Paz is made possible by the assistance of ants in destroying the cotton-boll weevil. Brief notes are given on the habits of this ant.

Grasshoppers in alfalfa fields, S. B. Doten (*Nevada Sta. Bul. 57, pp. 6, pls. 2*).—Grasshoppers are considered the most injurious insects in the State of Nevada. They do greatest damage to the second crop of alfalfa. Notes are given on the habits and life history of the pests. Deep fall plowing is recommended for the destruction of the eggs. Fall plowing is more effective than spring plowing. Harrowing in the spring destroys a considerable proportion of the eggs. The use of poisoned baits and various forms of hopperdozers is also recommended.

Combating wireworms in cereals, G. Caruso (*Atti R. Accad. Econ. Agr. Georg. Firenze, 4. ser., 26 (1903), No. 4, pp. 373–380*).—Tests were made of fertilizers, white mustard, and lupines in determining their value for preventing the attacks of wireworms in cereal fields. The wireworms were found to be most numerous in the first 30 cm. of soil and most injurious during fall and winter. Oil of tar sprayed on the soil at the rate of 25 kg. per hectare had no effect on the wireworms. Lupines, however, checked them to a considerable extent.

Black grub or cutworm, E. E. Green (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2 (1904), No. 11, pp. 2*).—Brief mention is made of the usual mechanical and chemical methods of combating cutworms.

Grubs on oats (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 4*, *pp. 215, 216*).—For preventing injury to oats from crane-fly larvæ it is recommended that the ground be thoroughly ploughed in June or July, and that the soil be treated with gas lime at the rate of 3 or 4 tons per acre.

The western cricket, S. B. Doten (*Nevada Sta. Bul. 56, pp. 18, pl. 1*).—A study was made of the life history of *Anabrus simplex* for the purpose of learning a successful method of combating the pest. The crickets invade cultivated fields from the grazing lands and foothills. They may be checked and destroyed by water in irrigation ditches. Trenches with vertical sides serve to prevent the further progress of the insects. Kerosene appears to have but little effect on them. Poisoned horse dung or poisoned bran is an efficient means of destroying the pests. The most certain method of protecting fields against the attacks of crickets consists in the use of barriers of oilcloth or tin. The tin may be obtained from kerosene cans and should be about 12 in. high. The crickets are unable to jump over it.

In Nevada much damage is done to alfalfa. The crickets move in immense armies and seem to withstand very inclement weather. The eggs are deposited in the soil of the lower foothills. The crickets reach full size about the middle of July.

The nut-grass coccid, W. W. Froggatt (*Agr. Gaz. New South Wales, 15* (*1904*), *No. 5, pp. 407–410*).—*Cyperus rotundus*, known as nut grass, is considered one of the worst weeds in New South Wales. This weed has been held in check and, in some localities, quite exterminated by a scale insect (*Antonina australis*), which infests the roots of the plant. The habits and life history of the insect are described.

Destruction of slugs, S. Mottet (*Ann. Soc. Agr., Loire, 2. ser., 23* (*1903*), *Nos. 3, p. 202; 4, p. 236*).—Dusting with ashes or lime is recommended. Slugs have the habit of collecting under some protection during the daytime and may be readily destroyed in such situations.

Results of practical experiments with peach borer, C. C. Newman (*South Carolina Sta. Bul. 83, pp. 9*).—On account of the general prevalence of this pest in Scuth Carolina, experiments were undertaken to control it. As a result of these experiments it is recommended that the soil be removed about the base of the peach trees in the fall and that the trunks be coated with a wash containing lime, whale-oil soap, sulphur, and Paris green. This process should be repeated about the middle of March. Detailed directions are given for preparing the wash and notes are presented on the habits and life history of the pest. The careful inspection of nursery stock is also recommended.

The gypsy moth, P. Lesne (*Jour. Agr. Prat., n. ser., 7* (*1904*), *No. 26, pp. 836, 837, figs. 3*).—The habits and life history of this pest are briefly noted. It recently defoliated oak trees over large areas in Hungary. The usual remedies are recommended, preference being given to destruction of the eggs.

Studies on the transformations of saturnian moths, with notes on the life history and affinities of Brahmæa japonica, A. S. Packard (*Proc. Amer. Acad. Arts and Sci., 39* (*1904*), *No. 22, pp. 547–578*).—Detailed biological and economic notes are given on a number of species of the family Saturniidæ, with an account of their habits and structure.

The tea tortrix, E. E. Green (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2* (*1903*), *No. 3, pp. 33–46, pl. 1, fig. 1*).—*Capua coffearia* has caused serious damage to tea since 1889. The insect is described in all its stages, and notes are given on its food plants, distribution, and natural enemies. There are about 6 broods per year. Collection and destruction of the eggs is considered the most effective remedy.

Shot-hole borer, E. E. Green (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2* (*1903*), *No. 9, pp. 141–156, figs. 7*).—The appearance, habits, and life history of *Xyleborus fornicatus* are discussed, with notes on its food plants, natural enemies, distribution, and means of repression. This beetle is particularly injurious to tea plants.

The pest may best be combated by thorough pruning and destruction of infested wood, combined with the rational use of fertilizers.

The "lobster caterpillar," E. E. GREEN (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2 (1903), No. 5, pp. 97–107, pls. 3*).—Notes are given on the habits, life history, and injurious attacks of *Stauropus alternus*, which is usually considered a rare species or of no economic importance. It has recently caused great damage to tea in the Kalutara district. The distribution, natural enemies, and food plants of the pest are also discussed. It may best be treated by thorough pruning and the use of arsenical sprays.

Parasites of coffee in New Caledonia, SPIRE (*Agr. Prat. Pays Chauds, 3 (1904), No. 16, pp. 480–483.*)—Attention is called to the scarcity of literature on this subject. The author presents notes on the habits, life history, and means of combating cockchafers, *Aphis coffeæ*, and certain leaf-eating caterpillars.

Cocoanut beetles, L. C. BROWN (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 2, pp. 65–67*).—Notes are presented on *Rhynchophorus ferrugineus* and *Oryctes rhinoceros*. The former, or red beetle, is very injurious to the cabbage in its larval stage. The burrows of the second species offer an opportunity for the first species to attack the trees. In combating these pests it is usually sufficient and practicable to dig out the beetles from infested trees.

Cabbage diseases and insects, J. B. S. NORTON and T. B. SYMONS (*Maryland Sta. Circ. Bul. 58, pp. 10, figs. 6*).—Descriptive and biological notes are given on club root, black rot, soft rot, wilt, and mildew of cabbage. The authors also describe and mention the chief means of combating a number of injurious insects including imported cabbage butterfly, cabbage plusia, cabbage mamestra, diamond-back moth, harlequin cabbage bug, and cabbage aphis.

A castor-oil pest (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 1, pp. 22, 23*).—*Ophiusa melicerte* and *O. serva* are reported as very injurious to castor bean, the caterpillars devouring nearly the whole plant. It is recommended that the caterpillars be shaken into nets or cloths and also caught by means of lantern traps.

Elm-leaf beetle, P. L. LESNE (*Jour. Agr. Prat., n. ser., 7 (1904), No. 14, pp. 456–460, pl. 1*).—A history is given of some of the most serious outbreaks of this pest in France. The habits and life history of the insect are described. Formulas are presented for the preparation of arsenical and contact insecticides. Preference is given to the latter class of remedies. The most convenient means of spraying trees are also briefly described.

Catching insects with lantern traps, D. BELLET (*Jour. Agr. Prat., n. ser., 7 (1904), No. 13, pp. 415, 416*).—A brief review of the work done in the United States with lantern traps.

A new wash for scale insects (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 5, pp. 110, 111*).—A brief review is given of the work along this line in Georgia, Connecticut, and Illinois. Various formulas are suggested for the preparation of lime-salt-sulphur wash.

Fungicides, insecticides, and spraying calendar, G. E. STONE, H. T. FERNALD, and F. A. WAUGH (*Massachusetts Sta. Bul. 96, pp. 16, fig. 1*).—Formulas are given for guidance in the preparation of the most important insecticides and fungicides, including materials used in fumigation. Directions are also given for the preparation of mixtures of insecticides and fungicides. Suitable treatment is recommended for insect pests and fungus diseases of greenhouse plants. A general outline is given for treatment of the common fruits and garden vegetables.

Revised plant import regulations, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 24 (1904), No. 6, pp. 702–707*).—It is urged that the conditions in South Africa fully justify drastic measures to prevent the further introduction of insect pests and fungus diseases. A copy is given of the revised law of Cape Colony relating to this

matter. The law provides for the compulsory fumigation of all imported trees and woody plants.

Formaldehyde fumes and steam according to the method of Esmarch, KISTER and TRAUTMANN (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 3, pp. 379-393*).—The authors tested Esmarch's method, which consists in a combination of a disinfectant, such as formaldehyde, heat, and vacuum. Under ordinary conditions formaldehyde fumes were found to have little penetrating power. Insects such as fleas, flies, and bedbugs were killed when the temperature reached 60-70° C. in the room, but remained alive at 40° C. Moist heat combined with formaldehyde fumes seemed to be very effective in destroying bacteria and household insects.

Directions for mailing insects, E. D. SANDERSON (*Texas Sta. Circ. 9, p. 1*).—Specific directions are given regarding the manner of packing and shipping insects so as to comply with the regulation of the Post-Office Department and so as to secure the safe arrival of the insects.

The study of "insects" in the public schools, T. B. SYMONS (*Maryland Sta. Circ. Bul. 55, pp. 13, figs. 15*).—In the author's opinion entomology is peculiarly adapted to fill a place in nature study in the public schools. The variety of species is very great and material for study is easily obtained. The general biological laws may be conveniently studied in insects. Directions are given for collecting, preserving, and studying insects. The bulletin is intended as a guide to teachers in the collection and study of insects and in class-room demonstrations.

The destruction of white ants, A. LOIR (*Agr. Prat. Pays Chauds, 3 (1903), No. 13, pp. 19-31, figs. 4*).—The various forms of individuals in white-ant colonies are described in detail, and notes are given on the habits, natural enemies, and means of combating these pests. Bisulphid of carbon and SO_3 are recommended for destroying the insects in their tunnels.

The botfly, R. E. WEIR (*Jour. Dept. Agr. West Australia, 9 (1904), No. 1, pp. 17, 18*).—This insect appears to be increasing in numbers in West Australia. The symptoms of infestation are briefly described. Formulas are given for medicinal treatment of infested horses.

Preventive and remedial measures against mosquitoes, C. B. SIMPSON (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 354-357*).—The author recommends the usual remedies, such as drainage, use of kerosene, and screens for destroying larval and adult mosquitoes.

Fighting mosquitoes in California, H. A. CRAFTS (*Amer. Inventor, 12 (1904), No. 14, p. 310*).—Brief notes on the work of the California Experiment Station in exterminating mosquitoes.

Bee keeping, R. WEST (*Jour. Jamaica Agr. Soc., 8 (1904), No. 6, pp. 223-226*).—The author discusses the characteristics and comparative advantages of different races of bees and the management of queens.

Bee keeping, R. WEST (*Jour. Jamaica Agr. Soc., 8 (1904), No. 7, pp. 282-284*).—Attention is called to the importance of a proper selection of bees in order to obtain vigorous colonies with long-lived individuals and increased honey-gathering power.

Bee notes, J. SUTTON (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 3, pp. 145-147*).—The past season has been unfavorable to honey production on account of the protracted drought and prevalence of bee diseases. In some localities the bee hives were invaded by ants. It was found to be a comparatively simple matter to destroy these insects in their nests.

Means of improving the races of bees, E. VAN HAY (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 1, pp. 43-48*).—Honey production may be increased by proper selection of bees of a given race, by judicious crossing of different races, and by the use of improved apparatus. Brief mention is made of the chief desiderate in a profitable swarm of bees. Notes are also given on experiments for the purpose of increasing the length of the tongue of bees.

The United States Department of Agriculture and silk culture, L. O. HOWARD (*U. S. Dept. Agr. Yearbook 1903, pp. 137-148, pls. 5*).—A historical statement is given of the various efforts which have been made in this country to establish the raising of silk worms upon a profitable basis. The present work of the Department along this line began July 1, 1902, and has involved an inspection of methods of silk raising in southern Europe, the purchase of cocoons by the Department, and experiments in reeling silk.

The outlook for a natural market for cocoons in this country is considered problematical but rather hopeful. In order to show the economic importance of raising our own raw silk, statistical data are presented concerning the importation of raw silk during the years 1892 to 1902.

FOODS—NUTRITION.

Entire wheat flour, C. D. WOODS and L. H. MERRILL (*Maine Sta. Bul. 103, pp. 61-76, pl. 1*).—The results of studies upon the milling of wheat, chemical composition, digestibility, and nutritive value of so-called entire wheat, Graham, and ordinary flours are summarized and discussed. The fact is pointed out that the introduction of the roller process of milling has made it possible to utilize hard spring wheats rich in gluten and to include in the straight or standard patent flour a considerable portion of the grain which in the old process of milling was lost in bran and middlings. It is noted that "this has materially improved the bread flours in common use until the standard flours from hard wheat carry more protein than almost any Graham flour in the market 25 years ago, and as much or more than many Graham flours now on the market. Furthermore, the demand for bread flour of high gluten content has stimulated wheat breeding and the growing of hard wheat, so that even winter wheats are now grown which in gluten content rival the hard spring wheats of the Northwest."

Analyses of cleaned wheat and bran from entire-wheat flour and from straight-grade flour are reported. These analyses and microscopical studies showed that the brans from the 2 sorts of flour were "as nearly identical as 2 brans from the same kind of milling and the same wheat would be likely to run."

According to the authors' calculations 100 lbs. of cleaned wheat will, with modern methods of milling, yield very nearly 100 lbs. of Graham flour, about 85 lbs. of entire-wheat flour with 15 lbs. of bran, or about 72 lbs. of straight or patent flours with 13 lbs. middlings and low-grade flour and 15 lbs. bran. In other words, the entire-wheat flour and the standard patent flour differ from each other only in that the former contains the middlings and low-grade flour, the bran being omitted from both.

"It therefore follows that whatever of nutritive value there is in entire-wheat flour that is lacking in patent flour must be sought for in the middlings and low-grade flours. These materials are usually higher in protein content than the straight flour. The protein of the most importance in wheat flours is in the form of gluten. The gluten of second clear flour is of poor quality and on this account this grade of flour makes a heavy loaf. The red-dog flour is obtained from the germ or embryo and adjacent parts of the kernel. While usually high in protein, it is dark in color, and because of the poor quality of its gluten has little expansive power and makes a very inferior loaf. The middlings contain much of the germ, the aleurone layer of the bran, and finely ground particles of the outer coatings. It is usually high in protein content, but with practically no gluten.

"It is probable that much of the laxative qualities noticed in Graham flour and which Lawes and Gilbert attributed to the coarse particles of bran, are in reality due to the character of the protein and mineral compounds of the aleurone layer and the germ. For while entire-wheat flour is not so much of a laxative as Graham, it pos-

sesses this property to such a degree that the claims made by some manufacturers that it is a 'complete remedy for constipation' would probably hold true in most cases.

"The low-grade flours and the middlings carry quite high percentages of ash which are valuable in nutrition. All these nutrients found in the low-grade flour and middlings enter into the entire-wheat flour, and upon them depend the differences between entire wheat flour and patent flour."

Studies on the nutritive value of different sorts of bread carried on in cooperation with this Department are summarized. (See below.)

A milling experiment with entire-wheat flour, C. D. Woods and L. H. Merrill (*Maine Sta. Bul. 103, pp. 77–80*).—The details of a milling experiment are reported in which so-called entire-wheat flour was ground from No. 1 hard northwestern spring wheat.

"At this mill, and at all mills where we have been given definite information, the cleaned wheat is crushed between rollers and purified in the same way as in the manufacture of patent flour, with the exception that all the product other than the bran is included in the flour."

From the 1,031 lbs. of wheat ground 81.9 per cent entire-wheat flour and 17.5 per cent bran were obtained, the loss in milling being 0.6 per cent. The yield of bran was somewhat smaller than usual according to available data. The authors note that it was well cleaned and that the yield could not have been greatly increased with this particular wheat with further treatment. "On the other hand, the flour contained less crude fiber than most samples of entire-wheat flour examined at this station, and under the microscope there was less of the outer layers of bran cells than in most flours of this class. . . . Apparently the flour differed from straight patent flour only in containing the middlings, red-dog, and second clear flours, which are kept out of the high-grade patent."

Analyses of the wheat, flour, and bran are reported. Of the total nitrogen of the wheat 80 per cent was found in the flour and 20 per cent in the bran. In the case of ash 42.5 per cent was found in the flour and 57.5 per cent in the bran.

Wheat flour and bread, H. Snyder and C. D. Woods (*U. S. Dept. Agr. Yearbook 1903, pp. 347–362*).—Some of the data obtained in experiments carried on in cooperation with this Office are summarized and discussed. According to the authors, "while the coarser grades are not more nutritious than the finer flours, there are many cases in which they are especially desirable, as, for instance, for persons of sedentary habit and occupation, because their stimulating of the alimentary tract may help to procure a larger secretion of the digestive juices and also to overcome a tendency to constipation. This, however, is a purely physiological action, and should be considered apart from the nutritive value.

"Finally, it may be said that wheat flour of all the various grades is one of the cheapest, most digestible, and most nutritious of human foods, and well worthy of the high estimation in which it is generally held. The use of different sorts of wheat flour is a convenient way of giving variety to the diet, a matter which is of no little importance."

Studies on the digestibility and nutritive value of bread, C. D. Woods and L. H. Merrill (*U. S. Dept. Agr., Office of Experiment Stations Bul. 143, pp. 77*).—The results of a number of natural and artificial digestion experiments with bread made from standard patent, whole wheat, and Graham flour, ground from the same lots of wheat, were in accord with those obtained in earlier investigations of this series (E. S. R., 15, p. 63), and showed that the patent flour is slightly inferior to the coarser flour as regards composition, but is superior as regards digestibility, so that in general it may be said that bread made from all the common grades of flour is quite thoroughly digested and differs little in nutritive value. The investigations emphasize the fact that breads of all sorts are among the most useful and economical

articles of diet. In connection with the digestion experiments the income and outgo of nitrogen was determined.

Digestion experiments depend for their success quite largely upon an accurate separation of the feces, and different methods of accomplishing this were tested, including the use of knotted strings and of lampblack in gelatin capsules, some of which were treated with shellac, tannin, and formaldehyde, i. e., substances designed to retard the solution of the capsule in the stomach. None of the markers tested proved entirely satisfactory.

"While too great reliance should not be placed on a marker of any kind, as shown by the results of a large number of experiments, lampblack, when properly used, has given tolerably good results, and may be considered a valuable aid in the separation of feces. The texture of the feces and the time of their appearance (if the subject be of regular habits) are factors which must be considered of equally great importance.

"In digestion experiments reliable results can be hoped for only when the experimental period is fairly long, at least four days, and the subjects are of regular habits. Regularity is a matter of the greatest importance, since feces can rarely be so marked that separations can safely be made by color alone. Increased accuracy may be obtained when evacuations take place daily and at about the same hour. Retention of the intestinal contents beyond the usual period appears often to result in greater displacement of different portions of the feces than would otherwise be likely."

Report of the food commissioner, E. F. Ladd (*North Dakota Sta. Rpt. 1903, pp. 132–228*).—Under the provisions of the State pure-food law 268 samples of foods were examined for the detection of adulteration or sophistication, the period covered by the work including 6 months. The total number of samples examined, the author states, was larger than for the preceding year, "but the percentage of adulterated goods has been reduced from 72 to 32 per cent. The most marked change has been found in preserves, jams, jellies, etc. Where one year ago every sample examined was adulterated, now but 30 per cent are found to be illegal. We may add also that the quality has been proportionately improved."

Analyses are reported of a number of samples of canned and potted meats, spices, and teas. The report also contains a summary of court cases and some data regarding the State pure-food law.

Foods, T. S. Dymond and F. Hughes (*Essex Education Com., Notes Agr. Anal. County Tech. Labs., 1901–1903, pp. 22–31, 40–46*).—Analyses are reported of a number of feeding stuffs, samples of milk, and potable and other waters.

Foods and food control, W. D. Bigelow (*U. S. Dept. Agr., Bureau of Chemistry Bul. 69, pt. 6, pp. 463–503*).—This bulletin contains a digest of the food laws in force in the United States on July 1, 1902, and also serves as an index to the compilation of these laws contained in the parts previously published (E. S. R., 14, p. 683).

Foods and food control. I, Legislation during the year ended July 1, 1903, W. D. Bigelow (*U. S. Dept. Agr., Bureau of Chemistry Bul. 83, pt. 1, pp. 157*).—The food legislation enacted during the year ended July 1, 1903, in the United States and the insular possessions has been compiled.

The danger of keeping food products warm, F. Schardinger (*Wiener Klin. Wchnschr., 16 (1903), p. 468; abs. in Hyg. Rundschau, 14 (1904), No. 8, pp. 383, 384*).—Bacteriological studies showed that bad results may follow when food is kept warm for a considerable time.

Determination of effect of preservatives in foods on health and digestion, H. W. Wiley (*U. S. Dept. Agr. Yearbook 1903, pp. 289–302*).—Experiments extending over long periods have been carried on at the Bureau of Chemistry with healthy young men to study the effects of adding borax and boric acid to the diet. These are briefly described and some of the results are summarized as follows:

"The addition of small quantities of borax or boracic acid to the food of healthy subjects, even for a considerable period, extending in some cases to fifty days, produces a slight disturbance in the digestion and assimilation of the food.

"In larger quantities the effect produced upon different individuals varies. In some cases large quantities are tolerated with apparently little inconvenience, while in other cases, when the amount given daily reaches 2 or 3 gms., somewhat profound disturbances of normal conditions are developed. These disturbances are manifested by a feeling of depression and discomfort, attended very frequently by a dull and continued headache, with a sense of fullness in the head. In no instance, even when large doses were administered, did either borax or boracic acid produce any pronounced symptoms of diarrhea or diuresis.

"When pushed to the limit of toleration the quantities of the borax or boracic acid which produce nausea, vomiting, and loss of appetite vary greatly with the individual. In some cases these symptoms were produced by from 3 to 4 gms. daily, while in other instances these quantities could be tolerated.

"The elimination of the added borax or boracic acid is accomplished mostly through the kidneys. The merest traces of the ingested substances are found in the feces, and considerable quantities in the perspiration.

"The effect of the added preservatives upon the metabolic processes is of such a character as to be properly discussed only in connection with the analytical data relating thereto, and this discussion will be found in the proposed bulletin.

"By reason of the different degrees of susceptibility to the influences of these added substances manifested by different individuals, it is evident that it is impossible to foretell in any given case what effect may be expected. For this reason the protection of those more sensitive to the influences of these preservatives seems to be a wise and just measure. Hence, without concluding from this experiment that the use of boracic acid and borax in food products should be absolutely prohibited, it is evident that if they are employed proper notice of the fact should be given to the consumer, either on the labels of the packages or otherwise."

Cream as a farm product and a food, J. O. Peet (*Jour. British Dairy Farmers' Assoc., 17 (1902), pp. 17–26*).—Different methods of obtaining cream, its preservation, food value, and other topics are spoken of.

As pointed out by the author, "cream is a highly concentrated food, especially rich in fat, which is the most efficient of all food constituents in the production of heat and energy in the body of the consumer. Foods rich in fat are usually somewhat difficult of digestion, and are neither very agreeable to the majority of palates, nor easily retained by delicate stomachs. The fat of cream, however, like that of most dairy products, is easily digested, probably because of the very fine state of division in which it is present.

"Cream is also easily retained by the stomach, and is frequently given to patients suffering from diseases in which a light, nutritious, and easily retained diet forms an important part of the curative treatment. The proportion of fat is too high for it to be classed as a well-balanced food, and it is unsuitable for forming a large proportion of a diet; but it is a most nourishing and agreeable constituent of a mixed diet, and its use along with tea, fruit, and pastry is certainly increasing amongst the middle and the artisan classes."

Breakfast foods, C. E. Ellis (*Iowa Agr., 5 (1904), No. 1, pp. 19–21*).—A brief summary of a publication previously noted (E. S. R., 15, p. 884).

Paraguay tea, F. W. Neger and L. Vanino (*Der Paraguay-Thee. Stuttgart: F. Grub, 1903, pp. 56, figs. 22; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, p. 637*).—In this monograph the authors discuss the botany, culture, chemistry, and uses of Paraguay tea, and related questions.

Judging natural ice, M. Klostermann (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, pp. 546–549*).—The need of caution in the use of ice is insisted upon,

owing to its possible contamination with micro-organisms, especially typhoid bacteria.

Investigation of canned-food products, P. SCHWEITZER (*Missouri Sta. Rpt. 1903, pp. 28–31*).—According to the author, "nearly every one of the thirty-eight brands of canned vegetables and fruits tested contained preserving agents. Sulphur dioxid or some bisulphite, and boracic acid or borax are the chemicals employed for the purpose, having superseded salicylic acid, formerly often employed, and formaldehyde, neither of which occurred in any one of the brands under examination. Without entering here into a discussion of their deleterious effects, they should as a matter of common equity not be employed in the preparation of any food substance, and are to be unequivocally condemned."

The presence of tin in large amounts was noted in some of the samples examined.

Concerning the sugar content of canned peas, F. SCHWARZ and F. RIECHEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, pp. 550–553*).—Experimental data are reported.

Identification of sprats in preserved sardines and anchovies, M. HENSEVAL (*Trav. Sta. Recherches Pêche Maritime Ostende, 1903, p. 89; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 556*).—Differences in these fishes are pointed out which, in the author's opinion, render possible the identification of sprats in canned goods.

Smoking and canning sprats, M. HENSEVAL (*Trav. Sta. Recherches Pêche Maritime Ostende, 1903, pp. 60–66; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 555*).—Methods are described.

Concerning the value of meat extract and other artificial condiments, K. BEERWALD (*Ztschr. Diätet. u. Phys. Ther., 8 (1904), No. 2, pp. 111, 112*).—The value of meat extract as a stimulant to the flow of digestive juices and related topics are spoken of. In the author's opinion the yeast preparations, which are in some respects similar to meat extract, are much inferior to it.

Meat preservatives, A. REINSCH (*Ber. Untersuchungs. Altona, 1903, p. 7; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 555*).—The results of the examination of several preservatives are reported.

Chemistry of oysters (*Pharm. Jour., 4. ser., 16 (1903), p. 46; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 556*).—Proximate and ash analyses of oysters are reported. According to the author, the nutrients are largely present in a form in which they are readily assimilated. It is stated that one-half the crushed oyster and one-fourth of the whole oyster is soluble in water. The solubility in various alcoholic beverages is also spoken of.

The investigations on the nutrition of man which have been conducted in the United States under the direction of W. O. Atwater, R. TIGERSTEDT (*Hygiea, 65 (1903), pp. 376–408*).—The author summarizes and discusses the investigations on the nutrition of man which have been reported in bulletins of this Office.

Nutrition investigations at the Government Hospital for the Insane, Washington, D. C., W. O. ATWATER (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 503–512*).—A brief account is given of nutrition investigations which were carried on at the Government Hospital for the Insane. So far as can be judged from the results of these studies as compared with similar data obtained elsewhere, the dietetic management of the institution was very satisfactory.

The author reports that opportunities for improvement were observed, which, however, have to do with details rather than with the system as a whole; that the diet was varied and attractive and certainly abundant, but that on the whole the waste was larger than seems necessary, which would partially account for the fact that the cost of the diet was higher than would appear needful on theoretical grounds and higher than that of a similar diet in other institutions. He adds that, with the knowledge of theoretical requirements and existing conditions, it should be possible

to provide an entirely satisfactory diet without unnecessary waste, and thus materially reduce the cost. (See also E. S. R., 15, p. 703.)

Who is underfed? H. STERN (*New York Med. Jour. and Philadelphia Med. Jour., 79 (1904), pp. 811, 812; Dietet. and Hyg. Gaz., 20 (1904), No. 7, pp. 405-409*).—In connection with a discussion of food with special reference to underfeeding and overfeeding, the author considers the food requirements of normal individuals. In his opinion a normal individual may remain in good physical condition on a diet furnishing 30 to 35 calories of total energy or 23 to 28 calories of assimilable energy per day per kilogram of weight. He states that in his experience women have been found to require only a very little less energy than men.

Contribution to the metabolism of phosphorus, L. BÜCHMANN (*Ztschr. Diätet. u. Phys. Ther., 8 (1904), Nos. 2, pp. 67-74; 3, pp. 148-160*).—In experiments with 2 convalescent patients, in which egg yolk with and without added lecithin and edestin formed a part of the diet, the income and outgo of nitrogen, phosphorus, calcium, and magnesium were studied, as well as the digestibility of fat and carbohydrates.

The conclusion was drawn that lecithin must be regarded as very important in inducing gains of tissue containing phosphorus. The experiments did not furnish data for judging how much it surpassed other organic phosphorus compounds. Since it was so superior to edestin combined with inorganic phosphorus compounds in the experiments reported, it seemed clear in the author's opinion that inorganic phosphorus was all excreted. Whether or not this is always the case must be learned by further experiments. No relation between the excretion of nitrogen and phosphorus was noted.

The metabolism of phosphorus in the adult man, C. TIGERSTEDT (*Skand. Arch. Physiol., 16 (1904), No. 1-2, pp. 67-78*).—The author was himself the subject of experiments in which the metabolism of phosphorus was studied in a diet made up of starch, butter, sugar, etc., and practically free from phosphorus. The average amount in the feces was 0.134 gm. per day, a quantity which the author considers practically equal to the amount excreted through the intestines as a metabolic product.

The income and outgo of phosphorus was determined on a mixed diet, but no conclusion could be drawn as to the question whether increased consumption of this constituent results in retention rather than equilibrium. On a vegetarian diet the percentage amount of phosphorus excreted in the feces was greater than on a mixed diet. In these tests the balance of income and outgo of nitrogen was also reported and discussed. When the diet contained practically no nitrogen the average amount excreted in the feces was 0.65 gm. per day.

A metabolism experiment with vegetarians, W. CASPARI and K. GLAESSNER (*Ztschr. Diätet. u. Phys. Ther., 7 (1904), No. 9, pp. 475-485*).—On a strictly vegetarian diet one of the subjects, a man, digested 73.79 per cent protein and 88.49 per cent fat, the energy of the digested food being 91.11 per cent of that of the total food. Similar values for the other subject, a woman, were 75.79, 89.92, and 92.93 per cent. The balance of income and outgo of nitrogen was determined, as well as the different nitrogenous constituents of the urine.

The author points out that the physiological nutritive value of the vegetarian ration was about the same as in the case of a mixed diet, the greater loss of energy in the feces being offset by the smaller loss in the urine. Creatin was found in the urine, but no creatinin. The other constituents of the urine are briefly spoken of.

Review of agricultural investigations [on the nutrition of man], L. GRANDEAU (*Temps [Paris], 1904, May 7 and 21*).—Apropos of the organization of a new society in France in the interests of the hygiene of nutrition and the rational feeding of man, the author summarizes and discusses nutrition investigations which have been carried on in the United States, especially those conducted under the auspices of the Office of Experiment Stations.

Experiments on the behavior of iron in the human and animal body, H. LANDAU (*Ztschr. Klin. Med.* [*Berlin*], *46* (*1902*), *No. 1–4, pp. 223–283; abs. in Ztschr. Diätet. u. Phys. Ther.*, *7* (*1904*), *No. 9, pp. 514, 515*).—A large number of experiments led the author to conclude that inorganic iron salts were resorbed in the duodenum, though under ordinary physiological conditions the amount absorbed is very small. The form in which iron is stored and other related topics are discussed. Iron, it is stated, is largely excreted through the lower portion of the intestine, and only a very small amount through the kidneys.

The final products of the peptic digestion of protein, S. SALASKINE and Mme. E. F. KOVALOWSKAIA (*Zhur. Russ. Fiz. Khim. Obshch.*, *35* (*1903*), *pp. 421–424; abs. in Bul. Soc. Chim. Paris, 3. ser.*, *32* (*1904*), *No. 9, pp. 583, 584*).—The results obtained in the series of experiments reported confirm Hoppe-Seyler's belief that crystallizable bodies are formed from protein by the action of gastric juice.

Experiments on autodigestion in solutions of liver proteids, F. BOTTAZZI (*Bol. R. Accad. Med. Genova*, *18* (*1904*), *No. 3; abs. in Zentbl. Physiol.*, *18* (*1904*), *No. 4, pp. 98–100*).—The experiments were carried on with nucleo-proteids extracted from liver.

Concerning antialbumens, F. ROTARSKY (*Zhur. Russ. Fiz. Khim. Obshch.*, *35* (*1903*), *pp. 424, 425; abs. in Bul. Soc. Chim. Paris, 3. ser.*, *32* (*1904*), *No. 9, pp. 584, 585*).—Experiments are reported and discussed.

Mucin as a bacterial product, L. F. RETTGER (*Jour. Med. Research*, *10* (*1903*), *No. 1, pp. 101–108; reprinted in Studies Rockefeller Inst. Med. Research*, *1* (*1904*), *Art. 16*).—Mucin and an intermediate body, pseudomucin, were identified as products of bacterial action.

Concerning the connection between lability and activity of enzyms, O. LOEW (*Arch. Physiol.* [*Pflüger*], *102* (*1904*), *No. 1–2, pp. 95–110*).—In the author's opinion enzymic activity depends upon chemical or molecular lability, being very probably due to the presence of keton and amido groups. This lability of the atomic groups involves a condition of atomic motion which may be regarded as kinetic energy. This would be maintained by the free atmospheric heat and increased by artificial heat up to a certain point at which molecular rearrangement takes place. These and other theoretical considerations are discussed in the light of experimental evidence.

The regulation of heat by chemical means in man, J. E. JOHANSSON (*Skand. Arch. Physiol.*, *16* (*1904*), *No. 1–2, pp. 88–93*).—A controversial and polemical article. The author points out that man can endure a very low temperature without chemical heat regulation if the muscles are perfectly quiet. If the cooling is carried far enough the carbon-dioxid excretion increases; that is, a chemical heat regulation takes place.

Testing the Sondén-Tigerstedt respiration apparatus, TORA ROSENBERG (*Skand. Arch. Physiol.*, *16* (*1904*), *No. 1–2, pp. 79–87*).—The accuracy of the Sondén-Tigerstedt respiration apparatus was tested by burning a lamp in the respiration chamber, the conclusion being reached that the error due to the apparatus was only ± 0.76 gm. CO_2.

Concerning rye pollen and the poison in it which causes hay fever, KAMMANN (*Beitr. Chem. Physiol. u. Pathol.*, *5* (*1904*), *No. 7–8, pp. 346–354*).—The author studied the constituents of rye pollen and their properties, identifying an albumin as an active cause of hay fever. He recognized the fact that the pollen of other gramineæ and some other plants also possess similar toxic bodies.

ANIMAL PRODUCTION.

The chemical composition and feeding value of rice products, C. A. BROWNE, Jr. (*Louisiana Stas. Bul. 77, 2. ser., pp. 430–458, figs. 6*).—The results of microscopical studies of rice grain are reported, together with analyses of rice products and adulterated rice brans, and the results of artificial digestion experiments and of an

experiment with steers fed rice bran and rice polish. The digestion experiments with steers and some of the analyses have been noted from another publication (E. S. R., 15, p. 288), though in the present instance the data regarding the digestion experiments are more detailed.

The author points out the fact that rice hulls contain a high percentage of woody matter and insoluble silica, which has a detrimental effect on their feeding value, the sharp silica particles often causing irritation of the delicate membranes lining the digestive tract. The need of establishing a standard for rice bran is spoken of.

"Judging from the results of reliable analyses, rice bran should contain at least 12 per cent protein and 12 per cent fat, though an excessive amount of grits or broken rice might reduce these figures. In fixing a standard more stress should be laid, therefore, upon the maximum of fiber and ash. Rice bran exceeding 10 per cent fiber or 9 per cent ash should be regarded with suspicion. These limits are suggested, however, only tentatively, as the analyses of many samples from different mills are necessary before a standard can be fixed."

Rice bran and rice polish commonly contain grits or broken rice screenings in varying amounts. Judged by composition these grains have a high feeding value, but the author points out that many of the broken grains pass through the animal undigested.

"These fragments of rice are very hard to break up and are not easily affected by the digestive juices of the animal. Nearly 10 per cent of the dry matter in the excrement of an animal fed with polish consisted of undigested grits. If these grits could be ground up, or if they could be removed during milling, the digestibility of the feed would be increased."

Rice feeds are frequently found to be unpalatable owing to the development of rancidity. A number of determinations were made of the free fatty acids in oil from rice products. The amount reported varies from 6.9 per cent in oil from raw rice to 83.5 per cent in oil from very rancid rice bran. "The unheated bran turned very rancid; this change went on very slowly in the heated sample, and the slight increase observed was due probably to the natural oxidation which all oils and fats undergo on exposure to the air." The author recommends heating rice bran as a preventive of rancidity.

"If our millers could subject their bran as soon as it is made to a dry heat of 200 degrees Fahrenheit, or even higher, as is done sometimes in the kiln drying of various feeds, and then press the material into cake form, we believe all dangers of rancidity would be removed."

Another method for the prevention of rancidity which is proposed consists in the removal of a part of the oil. This the author believes would be advantageous as the percentage of fat is quite large and the oil would have a commercial value. Furthermore, the removal of the oil would perhaps counteract the laxative effects which have been noted when animals are fed large amounts of rice bran.

The milling of rice, feeding of rice products to farm animals, the fertilizing value of rice products, and other topics are also discussed.

The composition of Texas cotton-seed meal, H. H. Harrington and G. S. Fraps (*Texas Sta. Bul. 70, pp. 15, maps 2*).—The value of cotton-seed products is discussed, a list of Texas cotton-seed oil mills is given, and data regarding the composition of Texas cotton-seed meals reported.

"Of 46 samples of Texas meals tested, 33 contained over 7.5 per cent of nitrogen, while of 151 samples of meal examined in 9 other States only 8 contained over 7.5 per cent nitrogen.

"Texas cotton-seed meals on the average are richer in nitrogen than meal from other sections, and, therefore, should have a higher commercial value.

"The meals richest in nitrogen come from the western part of the State; those

lowest in nitrogen from the East, and the medium grades from the central cotton-growing region.

"There is very possibly a relation between the rainfall and the nitrogen content of cotton seed, the seed being richer in more arid sections. This difference may, however, be due to other causes."

Carob beans in the feeding of farm animals (*Rev. Gén. Agron.* [*Louvain*], *13* (*1904*), *No. 3, pp. 123–125*).—A summary of data on the feeding value of St. John's bread.

A summary of recent American work on feeding stuffs, C. F. LANGWORTHY (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 513–536*).—Data regarding investigations published in the United States during the last three and a half years, which have to do with the composition, digestibility, feeding value, adulteration, and sophistication of feeding stuffs, and related topics are summarized and discussed, with a view to showing the scope and extent of the work—particularly that carried on at the experiment stations.

Feeding-stuff inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 102, pp. 37–62*).—In carrying out the provisions of the State feeding-stuff law, 668 samples were analyzed, including cotton-seed meal, sugar and flaxseed meal, linseed meal, old and new process, gluten meal and feed, distillers' grains, a mixed feed containing distillers' grains, calf meal, molasses feed, animal meal, beef scrap, and similar products, poultry feeds, mixed and proprietary feeds, clover meal, bran, flour, and red-dog flour.

In general the feeding stuffs analyzed corresponded with the guaranteed composition. "The gluten feeds run considerably under the guaranteed percentage of protein. . . . The seasons of 1902 and 1903 were unfavorable to corn, and it may be that another season's goods may contain nearer 28 per cent protein. In compounding rations it will, however, probably be safer to discount this guarantee somewhat."

Commercial feeding stuffs sold in Maryland (*Maryland Agr. Col. Quart., 1904, No. 24, pp. 1–13*).—According to the provisions of the State feeding-stuff law analyses were made of a number of samples of Ajax flake, bran, corn-and-cob meal, cotton-seed meal, corn oil-cake meal, dried distillers' grains, gluten feed, hominy meal, linseed meal, malt sprouts, meat meal, middlings, red-dog flour, molasses feed, wheat screenings, calf meal, mixed and proprietary feeds, and poultry feeds.

Miscellaneous analyses, E. F. LADD (*North Dakota Sta. Rpt. 1903, pp. 33–35*).—Analyses are reported of wheat bran and shorts, stock food, prairie grasses, flax shive, and a commercial cattle feed. Some of the data reported follow:

Composition of prairie grasses and flax shive.

[Water-free basis.]

	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Quack grass	16.12	4.50	44.01	25.93	9.41
Sand grass	9.06	2.13	50.22	33.46	5.13
Flax shive	5.62	3.46	39.08	47.47	4.37

Molasses as stock feed (*Demeter, 2* (*1904*), *No. 8, pp. 26, 27*).—The manufacture, feeding value, and importance of molasses feeds is briefly discussed. According to the author one of the chief requirements in molasses feeds is a satisfactory absorptive material. "One of the best that has been tried is finely ground bagasse." Its absorptive power is high, and "from it and molasses a food can be made that has 70 per cent of digestible carbohydrates."

Alfalfa and beef production in Argentina, F. W. BICKNELL (*U. S. Dept. Agr. Rpt. 77, pp. 32, pls. 6, figs. 5*).—Alfalfa growing and its relation to the cattle-raising

industry in Argentina are discussed and data summarized regarding the character of the cattle raised, export trade, profits received, and related topics. According to the author, "at the rate of one animal to 8½ acres, the usual average carrying capacity of native grasses, alfalfa makes land for grazing purposes worth five to eight times as much as it was before alfalfa took the place of the native grasses.

"The proposition to feed dry alfalfa and corn has applied only to steers for export alive, but it is bound to be applied also to those destined for chilled beef, for experience is gradually teaching Argentine beef producers that a grass or alfalfa fed steer can not compete with a corn-fed steer. The latter will be sounder, more solid, and his carcass will cut up to much better advantage. The corn-fed beef is worth more to the pound, because it is firmer and has less water in it than that of animals fattened on green alfalfa or grass only."

Alfalfa is fed both green and cured. The profits in raising this crop for hay and methods of stacking and marketing the hay are spoken of. Many of the cattle in Argentina are wild and difficult to handle. Dehorning, etc., are facilitated by the use of a long chute called a bréte, the construction of which is described.

Steer and lamb feeding, J. J. Vernon (*New Mexico Sta. Bul. 50, pp. 45, pls. 6*).—The present status of the cattle and sheep industry in New Mexico, the management of cattle ranges, and similar questions are discussed and experiments to determine the possibility of profitably fattening stock under existing conditions are reported. In the sheltered New Mexico valleys the climate is so mild that animals need no protection in winter except such as is afforded by a wind-break.

In the first test 3 lots of 3 steers, each weighing about 1,900 lbs., were fed for 192 days during the winter. On alfalfa hay alone the steers made an average daily gain of 1.36 lbs. per head; those fed alfalfa hay and shredded Kafir-corn stover, 1.49 lbs., and those fed alfalfa hay and shredded corn stover, 1.16 lbs. The feed required per pound of gain was 17.82 lbs. on alfalfa hay alone, and the cost of a pound of gain 6.24 cts. Similar values for the Kafir-corn stover ration were 15.23 lbs. and 5.18 cts., and for the corn-stover ration 17.93 lbs. and 6.17 cts. The dressed weight was greatest with the alfalfa lot, 53.24 per cent, and least with the corn-stover lot, 51.3 per cent.

The second test was made with 4 lots of 8 steers each and covered 76 days in the winter. All the steers were fed alfalfa hay, lot 1 receiving in addition about one-third of a ration of corn, lot 2 a full ration of corn, and lot 3 about one-third of a ration of wheat, and bran 3:1. The average daily gain ranged from 1.22 lbs. per head with lot 1 (alfalfa and a limited corn ration) to 1.62 lbs. with lot 3 (alfalfa and mixed grain). In the case of the latter lot the smallest amount of feed, 12.09 lbs., was required per pound of gain, and the greatest quantity, 16.27 lbs., was noted with the former lot. The cost of feed per pound of gain ranged from 4.3 cts. with the steers fed alfalfa only to 6.59 cts. with those fed alfalfa and a limited corn ration. The dressed weight averaged about 51 per cent of the live weight in every case.

In a test with lambs 30 animals, weighing about 45 lbs. each, were divided into 3 uniform lots. In the 128 days of the test the lambs fed alfalfa hay alone made an average daily gain of 0.185 lb.; those fed alfalfa hay, shredded Kafir-corn stover, shredded corn stover, and corn, 0.233 lb., and those fed alfalfa hay, shredded Kafir-corn stover, and shredded corn stover, 0.144 lb., the cost of a pound of gain in the 3 cases being 4.15, 5.27, and 4.33 cts. The feed required per pound of gain ranged from 9.166 lbs. with lot 2 (fed grain) to 13.716 lbs. with lot 3 (alfalfa hay and stover without grain). The smallest dressed weight, 47.34 per cent, was noted with the latter lot, and the greatest, 54.31 per cent, with the former.

Among the conclusions drawn were the following:

"The results of these experiments indicate that feeding steers and lambs for the local markets will prove remunerative so long as dealers will pay the same price for the home-fed product that they must pay for the imported article of equal quality.

"Beef and mutton, of a quality suitable for the local market demands, can be produced by feeding alfalfa hay alone. In these tests the addition of grain, though rather high in price, showed the following advantages over feeding alfalfa hay alone: The return per ton for the alfalfa hay consumed was greater, more rapid gains were made, the feeding period was shorter, and a much better product was secured.

"The lambs in these experiments gave a greater return per ton for the alfalfa hay fed than did the steers.

"About one hundred days for lambs and five or six months for steers is a sufficient time in which to fit them for the local markets when fed on alfalfa hay alone. It will require less time when grain is fed with the alfalfa hay.

"Frequent weighing, because of the unavoidable excitement, is probably not conducive to rapid gains with range-grown steers."

Summer ranges of eastern Nevada sheep, P. B. KENNEDY (*Nevada Sta. Bul. 55, pp. 53, pls. 31*).—The grazing region studied lies in Eureka and Elko counties. Special attention was paid to the plants eaten, injury to plants by grazing and trampling, and methods of handling sheep. The principal forage plants were collected for identification and analysis.

In the author's opinion "there is plenty of forage for sheep at the present time on the eastern Nevada ranges.

"Grasses and grass-like plants are eaten to a very small extent by sheep during the summer, while cattle feed almost entirely on grasses. The forage for sheep during the summer consists for the most part of sunflowers, daisies, leaves of different shrubs, and many other plants commonly spoken of as 'weeds.'

"The plants which appear to have suffered most in this region are those of a shrubby nature, such as the Indian currant or snowberry, wild currants, rosebushes, service berry, and chokecherry. The sheep are responsible for the most part for the total destruction of numerous Indian currant, wild currant, and rosebushes. They eat them extensively during the fall months, feeding on the leaves and tender young shoots until finally the main stems die and a bunch of dry sticks remains. Cattle, however, are exceedingly destructive to the service berry and chokecherry.

"At the present time many of the ranges are better adapted for the raising of sheep than for cattle. This can be accounted for by the fact that the grasses which were once so abundant have been grazed on to an injurious extent by cattle and have not been allowed to produce seed, while the 'weeds' have been left untouched and have increased.

"The fact that water is frequently scarce in the late summer months has prevented the ranges from being overstocked by sheep."

The author discusses the problem of the control of sheep and cattle ranges and the need of studies of the feeding value of forage plants now growing on the ranges with a view to devising measures for restoring those which have been overstocked and keeping them in good condition.

Some of the plants found on the ranges are commonly regarded as poisonous, one of the principal ones being the poison camas (*Zygadenus paniculatus*), which is sometimes called poison sego lily or lobelia. So far as the author could learn no serious loss occurs from stock eating this plant in the spring, and he considers it probable that the large number of ewes and lambs lost at this time die from maternal or other causes.

Cape v. Turkey mohair, S. B. HOLLINGS (*Agr. Jour. Cape Good Hope, 24 (1904), No. 5, pp. 561–566, figs. 4*).—In an article quoted from the *Midland News* a number of different samples of mohair from the Cape of Good Hope and from Turkey are described.

Pig farming and bacon curing, W. FRANK (*Agr. Jour. Cape Good Hope, 24 (1904), Nos. 2, p. 243; 3, pp. 335, 336; 5, pp. 574, 575*).—A summary of available information with special reference to the requirements of local pig raisers.

The construction of pigsties (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 3, pp. 129–135*).—Directions are given for the construction of improved pigsties.

The artificial hatching of chickens (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 3, pp. 135–143, fig. 1*).—Tests of the artificial hatching of chickens carried on at the poultry farm of the college at Reading are reported. During the year 3,674 fertile eggs have been tested with 13 incubators and from these 2,572 chickens and ducklings were hatched. The incubators were kept in a specially constructed incubator house having provisions for satisfactory ventilation.

"The results of these observations prove that hatching houses can be successfully employed on a larger scale than has hitherto been thought desirable, and that a percentage of hatching may be obtained of more than 70, even where the operators have not had much experience. But to secure this result the conditions must be favorable, more especially in respect to ventilation."

The rearing and management of chickens (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4* (*1904*), *No. 4, pp. 672–676, figs. 2*).—A general discussion of the subject. The article has also been reprinted as one of the Department of Agriculture and Technical Instruction for Ireland leaflets (No. 43).

Cooperative poultry societies in Ireland, H. de Courcy (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 2, pp. 80–95, figs. 5*).—It is stated that the poultry industry in Ireland has been very much helped by the work of a number of societies and the present article describes the methods followed by one of them, the Irish Agricultural Organization Society.

Cooperation, according to the author, "has already taught the farmers and cotters to place on the markets produce which, in freshness, cleanliness, quality, and general mode of treatment, is on a level with the best produce of other countries, and it has proved by demonstration that it is not quantity but quality which pleases customers, retains their custom, and produces most money."

DAIRY FARMING—DAIRYING.

The college dairy herd, H. H. Dean (*Ontario Dairymen's Assocs. Rpts. 1903, pp. 155–161*).—Individual differences in the cows of the Ontario Agricultural College herd are pointed out and the improvement of dairy herds in general is discussed.

Some experiments on the passage of odoriferous and coloring substances into milk, Dombrowsky (*Arch. Hyg., 50* (*1904*), *No. 2, pp. 183–191*).—Various substances were fed to a goat. Anise and fennel seeds, and also garlic were readily eaten, the odor of these materials passing into the milk. Garlic produced not only the characteristic odor of this substance, but also a very disagreeable taste which persisted for a long time, even after heating and cooling.

The odor of anise and fennel was not disagreeable nor very strong, and was removed by heating. A change in the color of the milk was produced by carrots and chrysophanic acid, but the alteration was not marked. Alizarin produced a coloration only when given with alkalis. There is believed to be practically no danger of food causing marked modification in the color of milk. Slight changes in the odor are produced more easily.

The absorption of odors by milk was also studied. The odors of iodoform and anise oil were taken up readily and held for a long time. The odor of carbolic acid was taken up quickly, but readily lost. This is also true of turpentine and formalin. The odor of chlorid of lime was only feebly absorbed.

The composition of milk, H. D. Richmond (*Analyst, 29* (*1904*), *No. 339, pp. 180–189*).—The average composition of 15,313 samples of milk analyzed during 1903 was as follows: Specific gravity 1.0322, total solids 12.78 per cent, fat 3.83 per cent, and solids-not-fat 8.95 per cent. The average fat content of the morning milk was 3.62 per cent, and of the evening milk 4.05 per cent. The average interval between the

morning and evening milkings was 10.8 hours, and between the evening and morning milkings 13.2 hours.

Analyses of this character have been made at the same laboratory for a series of years and the results have sometimes been quoted as representing the average composition of milk in England. As this, however, has sometimes been disputed, the author considers the possibility of the samples analyzed being of exceptional quality. Milk coming from farms located on cretaceous formations showed a slightly higher percentage of fat than the milk from farms located on sandstone and clay formations, but the difference is not believed to be marked enough to permit of any sweeping assertions. The difference in the intervals between milkings, noted above, is also referred to as a cause of some samples being low in fat.

The author also discusses the views of Storch concerning the existence of a mucoid membrane surrounding fat globules, and concludes that the theory must be considered as disproved.

Contribution to the study of slowly creaming milks, L. MARCAS (*Rev. Gén. Lait, 3 (1904), No. 16, pp. 361–368*).—Samples of slowly creaming milk allowed to separate spontaneously in the separator and also subjected to centrifugal separation, left in both cases more fat in the skim milk than did ordinary milk. As a general thing, the samples of slowly creaming milk examined were richer in fat, total solids, and ash than the average milk furnished the dairy at which the investigations were made. Of the constituents in the ash, phosphoric acid and lime especially were increased.

On the breaking up of globules of fat in milk, C. BARTHEL (*Rev. Gén. Lait, 3 (1904), No. 19, pp. 434–440*).—Milk subjected to strong mechanical action has been reported to cream less perfectly and to give much greater differences between the Adams and Gottlieb methods of analysis than the same milk not subjected to such agitation.

The author believes that this difference is due to the breaking up of the fat globules into still finer globules, and in this article reports countings of the number of globules, both before and after churning for different periods ranging from 5 to 90 minutes. The number of globules increased in some instances from about 3 million to 11 million per cubic centimeter. Determinations of the percentage of fat by the Adams method showed a corresponding decrease, while the percentage determined by the Gottlieb method remained practically constant.

It is believed that the Gottlieb method might well be adopted universally as a standard method for the determination of fat in milk.

Investigations on the membrane surrounding fat globules in milk, W. VÖLTZ (*Arch. Physiol.* [*Pflüger*], *102 (1904), No. 8–9, pp. 373–414*).—Chemical investigations extending over a series of years are reported in detail, from which the author concludes that the fat globules possess a firm membrane containing nitrogenous and nonnitrogenous organic compounds, lime, phosphoric acid, magnesia, and sulphur, the proportions of the different constituents varying greatly in the different kinds of milk under investigation.

The proportion of nitrogen to ash ranged from 1:0.09 to 1:14.7; the proportion of organic substances to ash, 1:0.01 to 1:0.86; nitrogen to phosphorus, 100:0.15 to 100:15.5; and ash to phosphoric acid, 100:0.34 to 100:48.43. The author also reports staining the membrane with carbol-fuchsin. The individual globules showed great variation in the intensity with which the membrane was stained. The membrane did not appear to be homogeneous, and at times appeared in the form of a network.

On the origin of lactose, C. PORCHER (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 13, pp. 833–836*).—In order to determine whether lactose is formed in the animal body before reaching the mammary gland or is formed in the gland itself, the author removed the mammary glands of 2 goats and examined the urine before and after parturition.

In neither case was sugar present in the urine before parturition, but it was present in large quantities, mainly in the form of glucose, after parturition. A slight amount of lactose found in the urine was attributed to the incomplete removal of the glandular tissue. The author therefore concludes that normally the glucose is transformed into lactose in the mammary gland.

On the origin of lactose, C. PORCHER and COMMANDEUR (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 14, pp. 862–865*).—A study of the urine of a pregnant woman suffering with diabetes confirmed the author's conclusions, noted above, that normally lactose is produced from glucose in the mammary gland.

On the origin of lactose, C. PORCHER (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 15, pp. 924–926*).—Observations were made on cows affected with milk fever, the results of which, along with those obtained in previous studies, are believed to establish thoroughly the rôle of the mammary gland in forming milk sugar from glucose brought to it from the blood.

On the decrease in the citric-acid content of milk due to heating, G. OBERMAIER (*Arch. Hyg., 50 (1904), No. 1, pp. 52–65*).—The fact that symptoms of infantile scurvy often appear in infants fed sterilized milk, and the fact also that such symptoms tend to disappear by the feeding of uncooked milk or the administration of fruit juices containing citric acid, led the author to make determinations of citric acid in milk subjected to heating at different temperatures for varying lengths of time.

In general, heating was found to produce a notable diminution in the percentage of citric acid which, according to different observers, is normally from 0.18 to 0.25 per cent. Heating for 10 minutes on an open fire caused a diminution of about 15 per cent of the total amount present. The explanation is offered for this change that the citric acid exists normally in milk in the form of an acid salt, calcium bicitrate, and is transformed by oxidation during heating into calcium tricitrate, which is only slightly soluble. Heating at 80° C. produced a much smaller change in the content of citric acid, and in this respect pasteurization at that temperature is better than sterilization at 100°.

Influence of aeration on lactic fermentation, C. BARTHEL (*Rev. Gén. Lait, 3 (1904), No. 13, pp. 294–301*).—Experimental work is reported, from which the conclusions are drawn that aeration retards fermentation in milk due to bacteria belonging to the lactic-acid group, and that the retardation caused by aeration is still further increased by the lowering of the temperature.

Experimental investigations on the preservation of milk, C. NICOLLE and E. DUCLOUX (*Rev. Hyg. et Police Sanit., 26 (1904), No. 2; abs. in Bul. Inst. Pasteur, 2 (1904), No. 11, p. 504*).—Milk kept at 5° C. for 24 hours showed at the end of that time 10,800 bacteria per cubic centimeter, while milk kept at 14° showed 5,820,000 bacteria, showing the benefit of refrigeration in reducing the number of bacteria.

Tests were also made of hydrogen peroxid as a means of preserving milk. Hydrogen peroxid was added to milk to the extent of 1 to 2 per cent, and the samples were then kept at temperatures of 15, 22, and 34°. In the samples treated with hydrogen peroxid the number of bacteria diminished during the first 10 hours, following which the number of bacteria gradually increased, but did not in any case equal the number in the control samples. No trace of the antiseptic was found in the milk after several hours.

While the use of hydrogen peroxid has an advantage over pasteurization in not altering the constitution of the milk, it does not destroy the pathogenic bacteria.

On pasteurized milk, N. SWELLENGREBEL (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 11–16, pp. 440–448*).—Bacteriological examinations of pasteurized milk sold in hermetically sealed bottles in Amsterdam showed a wide variation in the bacterial content. The lowest number per cubic centimeter found was 290, and the highest 49,875. Other causes than the temperature of pasteurization were believed to influence these results.

Four such possible causes were studied, namely, the rubber band used in sealing the bottles, the dried milk on the inner surface of bottles not thoroughly cleansed, the formation of a membrane on the surface of the milk during heating, and the production of foam by the agitation of the milk. The use of perfect rubber bands and the thorough cleansing of the bottles were instrumental in lessening the bacterial content. In order to prevent the formation of a surface membrane and foam, it is believed to be better to heat the milk for a longer period at 60 to 65° C.

It is noted that while strong agitation prevents the formation of the surface membrane, it favors the production of foam and is, therefore, not to be recommended.

Utilization of milk as food, A. BONN (*Rev. Gén. Lait, 3 (1904), Nos. 16, pp. 368–372; 17, pp. 396–400*).—This is a brief résumé of legislation and regulations concerning the sale of milk in Germany, England, Belgium, Denmark, France, Italy, Switzerland, and the United States.

On the isolation of a ferment-producing enzym in cow's milk and human milk, J. STOKLASA (*Arch. Hyg., 50 (1904), No. 2, pp. 165–181*).—The author describes the isolation of a new enzym in milk having the power of fermenting lactose. The method employed in the isolation of this enzym is described in detail.

Milk powder prepared at the cooperative dairy of Oostcamp, C. HUYGE (*Rev. Gén. Lait, 3 (1904), Nos. 14, pp. 320–325, fig. 1; 17, pp. 400–402*).—Notes are given on the preparation and properties of this material, and several analyses are reported. The powder prepared from whole milk contained 3.62 per cent of water, 5.67 per cent ash, 26.75 per cent fat, 32.86 per cent casein, and 31.10 per cent of lactose.

Waste waters from dairies, F. SCHOOFS (*Rev. Gén. Lait, 3 (1904), Nos. 14, pp. 313–319; 15, pp. 344–352*).—This gives data concerning the quantity of water used in creameries, and reports results of chemical and bacteriological studies of the waste water.

The farm separator: Its relation to the creamery and to the creamery patron, E. H. WEBSTER (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 59, pp. 47*).—Introductory notes are given on dairying in the West, following which the author points out the advantages derived from the use of the cream separator on the farm, discusses rather fully the proper care and management of the separator, describes the most approved methods for the management of cream on the farm, reports investigations made in Kansas during 1903, and in conclusion presents a system of cream grading which was recommended by the author and adopted by a creamery company in Kansas. The subject is discussed first from the standpoint of the dairyman, and, secondly, from the standpoint of the creamery. It is distinctly stated that the subject is treated wholly from the standpoint of western practice.

The experimental work reported in the bulletin was performed by the author at Colby, and by C. E. Gray in Topeka. During the period from July 20 to August 1, 68 patrons delivered cream at the receiving station at Colby, where an acid test was made of every can received. The data obtained are tabulated. The acidity of the milking of the morning on which delivery was made averaged 9.3, as determined by Mann's acid test; of the evening before, 22.1, and of the morning before, 29.5. From 30 to 50 per cent of the cream received each day was sweet.

Maximum and minimum temperatures at Colby during the period are reported, and the conclusion is drawn that the factor of temperature has considerable influence on the acidity of the cream. When the deliveries were made on alternate days only a few patrons delivered sweet cream, and these were provided with means for cooling the cream quickly and keeping it cool until delivered. Many other facts were brought out, such as the irregular methods followed in the delivery of cream, variations in the size of the cans used, etc.

Part of the cream received at the Colby station was pasteurized, and all of it was shipped to a creamery in Topeka, where observations were made on the temperature, acidity, and condition of the cream. Cream showing an average acid test of 10.21

when pasteurized was found on arrival at destination, 24 hours later, to have increased in acidity to 16.14. Pasteurized cream 2 days in transit showed an acid test of 12.28 before shipment and 30.88 after. The corresponding figures for unpasteurized cream, 1 day on the road, were 21 and 33.8; and 2 days on the road, 26.5 and 38.5.

The cream was also graded before and after shipment, according to the system devised by the author. Detailed data are given in tabular form relative to the shipments of both the pasteurized and unpasteurized cream. Several conclusions are drawn from the results obtained. "One important deduction from this work is that it does not pay to pasteurize sour cream at the shipping station."

The system of grading cream, devised by the author, is based upon the acid test as giving a very fair indication of the quality of the cream. In the creamery adopting this system the dividing line between grades 1 and 2 was made at 15 by Mann's acid test. Detailed instructions for making this test by the use of alkaline tablets are given in the bulletin. It is believed that this system of grading cream will go a long way toward making a line of demarcation between good and bad cream.

Recent investigations regarding the factors that control water content in butter, F. T. Shutt (*Ontario Dairymen's Assocs. Rpts. 1903, pp. 80–86*).—This is a brief summary of investigations relating to the factors affecting the percentages of water and salt in butter, details of which are to appear soon in bulletin form. Some of the results regarding the water content may be noted as follows: The higher the churning temperature within reasonable limits the higher the water content. The high temperature of wash water also tended to a high moisture content, and vice versa.

It was found that a high churning temperature could not be sufficiently corrected by using cold wash water. The larger the granules the more water the butter contained. The water content was not affected by allowing the butter to drip from 10 to 30 minutes after washing. Unsalted butter contained slightly more water than salted butter. Working slightly before salting did not materially affect the water content. Increasing the period between salting and working reduced the percentage of water.

Some of the factors affecting the salt content of butter were as follows: Decreasing the temperature of the wash water lessened the salt content of the butter. The larger the granules the higher the percentage of salt. The heavier the salting the more salt was retained in the finished product. An interval of 24 hours between salting and working decreased the salt content as compared with salting after 24 hours and working at once.

On the causes of the changes occurring in canned butter, L. A. Rogers (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), Nos. 11–16, pp. 388–396; 19–21, pp. 597–602*).—This is an account of investigations also published in another form as Bulletin 57 of the Bureau of Animal Industry (E. S. R., 15, p. 1116).

Contribution to the study of the butters of the Vendée, P. Touchard and L. Bonnétat (*Bul. Mens. Off. Renseignements Agr., 3 (1904), Apr., pp. 433, 434*).—Analyses are reported of several samples of butter made from cream which had been separated by slowly heating the milk at a temperature of 80 to 85° C. for 3 or 4 hours. The fat content of the butter was low, ranging from 76.8 to 82.5 per cent; while the casein was proportionately increased. The butter has poor keeping qualties.

On the physical constitution of butter, M. Beau (*Rev. Gén. Lait, 3 (1904), Nos. 10, pp. 224–228, figs. 3; 11, pp. 247–252*).—Physical studies of samples of butter designated opaque, clear, and mottled are reported

Note on some physical constants obtained with margarin, E. Russell and V. H. Kirkham (*Analyst, 29 (1904), No. 340, pp. 206–208*).—Considerable variation in the composition of margarin is believed to be demonstrated by the analytical data for 15 samples which are reported.

Export butter, J. W. MITCHELL (*Ontario Dairymen's Assocs. Rpts. 1903, pp. 174–182*).—Some of the requisites of butter for export are briefly stated, and the manufacture of such butter is discussed.

Studies on whey butter, G. FASCETTI (*Rev. Gén. Lait, 3 (1904), No. 18, pp. 409–416*).—In some of the cheese factories in Italy butter is made from the fatty material (brèches) obtained from whey by acidification and heating at 75 to 80° C. The butter made from this fat is of inferior quality and is sometimes used to adulterate butter made from cream. The author's method of detecting such butter, either alone or in mixtures, depends upon the staining of the albuminous material associated with the fat globules. An alcoholic solution of rocellin, obtained from the lichen *Rocella tinctoria*, was found suitable for this purpose. A small quantity of the coloring material in solution is incorporated with the butter and the mixture is examined under a microscope, butter made from cream showing no coloration, while samples containing "brèches" butter are more or less extensively colored, depending upon the quantity present.

On some constituents of Emmenthaler cheese, E. WINTERSTEIN (*Ztschr. Physiol. Chem., 41 (1904), No. 6, pp. 485–504*).—This is in continuation of investigations previously reported (E. S. R., 14, p. 696).

The author finds in Emmenthaler cheese a series of nitrogenous products which may be looked upon as primary cleavage products of the proteids of the fresh cheese. These are glycocoll, alanin, amido-valeric acid, leucin, carbo-pyrrolic acid, aspartic acid, glutaminic acid, tryptophane, histidin, and lysin. Oxyamido acids are also probably present. The amounts of the different cleavage products were not constant. In addition to the substances named simpler products were found, as follows: Tetramethylenediamin, guanidin, pentamethylenediamin, and ammonia.

It is believed that tetramethylenediamin and guanidin are derived from arginin, and pentamethylenediamin from lysin, and that this change is brought about by the bacteria present in cheese. In addition to the crystalline cleavage products, peptones are also present, of which two are described. In the ripened cheese, moreover, nuclein bases and cholin were also found. The nitrogen-free constituents include succinic acid, citric acid, and also lactic acid.

The present status of the question of cheese ripening, W. WINKLER (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), Nos. 4–5, pp. 97–105; 9–10, pp. 273–289*).—The literature relating to the ripening of hard cheese is critically reviewed, a bibliography being appended to the article.

On the importance of strictly anærobic butyric-acid bacteria in the ripening of hard cheese, A. RODELLA (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 1–3, pp. 82–89*).—This is a discussion of this subject based, to a large extent, upon recently published work of the author. Such bacteria are believed to play an important part in the ripening process.

On the distribution of the bacteria in Grana cheese, C. GORINI (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 1–3, pp. 78–81, pl. 1; Rev. Gén. Lait, 3 (1904), No. 13, pp. 289–293, pl. 1*).—It was found that in this Italian cheese the bacteria were in part uniformly distributed throughout the mass, and in part aggregated in colonies of different sizes which were irregularly distributed. This irregular distribution of the bacteria serves to increase the causes of error in quantitative bacteriological examination.

On the swelling of Edam cheese, F. W. J. BOEKHOUT and J. J. OTT DE VRIES (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 1–3, pp. 89–93, pl. 1*).—A short thick bacillus growing readily on gelatin was obtained in a cheese factory, where the production of gassy cheese had long been a source of trouble, and used in experiments to determine the nature of this trouble.

Whey gelatin was inoculated with this micro-organism and the gas collected and analyzed. In 11 experiments from 27.7 to 52.8 cc. of gas was obtained from 160 cc.

of whey. The proportion of oxygen to carbon dioxid in this gas varied from 1 :2.51 to 1 : 1.45. Only a portion of the sugar in the whey was found to take part in the formation of these gases. In further experiments it was found that this micro-organism would not grow in the presence of over 0.3 per cent of lactic acid. It has been found possible in practice to lessen the production of gas by the addition of potassium nitrate. This was found experimentally to be converted into potassium nitrite, which was finally also decomposed. Sodium or potassium chlorate used in place of the potassium nitrite were also reduced in a similar manner.

In the production of gas where the atmospheric oxygen is excluded and the free oxygen contained in the cheese is soon used up, this micro-organism apparently decomposes the milk sugar; but when a more available source of oxygen, such as potassium nitrate, is present, this substance is apparently utilized first. When the added potassium nitrate was insufficient the milk sugar was also attacked. The addition, therefore, of potassium nitrate furnishes the micro-organism with oxygen in a more readily assimilable form than the oxygen of milk sugar, and also favors the transformation of milk sugar into lactic acid, which tends to check the growth of the gas-producing micro-organism.

On a slime-producing organism belonging to the Bacterium güntheri group, and the serious trouble caused by it in an Emmanthaler cheese factory, R. BURRI (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), Nos. 6-8, pp. 192-204; 11-16, pp. 371-388*).—In a cheese factory in Switzerland considerable trouble was experienced by the whey in the cheese becoming ropy within 8 to 12 hours after the cheese was put in the press. Such cheese was very much injured in appearance and tended to decompose early.

The investigation of this trouble by the author showed the causal agent to be a micro-organism not previously described, but resembling in its morphological and cultural characteristics *Bacterium guntheri*. This micro-organism produced ropiness in milk at a temperature of 37 to 40° C., and also brought about corresponding changes in cheese made from inoculated milk. The whey in such cheese was expressed only with great difficulty. The micro-organism was found in fresh milk obtained with great precautions to prevent infection.

It is therefore believed that the micro-organism was present in the udder. It was not found outside of milk and cheese. The changes brought about in milk by this micro-organism are similar to those previously described by other authors.

The preservation and safe transportation of butter and cheese, J. A. RUDDICK (*Ontario Dairymen's Assocs. Rpts. 1903, pp. 141-151, 170, 171*).—This is a general discussion of this subject, in which experimental data are reported on the loss in weight of cheese during curing, and also as affected by coating with paraffin.

The international dairy federation and international dairy congresses (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 46, pp. 14*).—This contains an account of the First International Dairy Congress, held at Brussels in September, 1903, and information concerning the second congress, which it is proposed to hold at Paris in 1905. The United States was represented on the permanent international dairy committee by the late H. E. Alvord, of this Department.

A provisional committee for the United States has been appointed for the purpose of arousing an interest in the international dairy movement, and an effort is being made to have the dairy interests of the United States fully represented in the International Dairy Congress and International Dairy Exposition to be held at Paris in October, 1905.

The dairy situation, W. D. HOARD (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 289-310*).—Needed changes in dairy methods are pointed out in this address.

Dairy management in New Jersey, E. B. VOORHEES (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 263-287*).—This is a general discussion of this subject, includ-

ing considerable statistical matter and results of experiments at the New Jersey Station.

Report of the dairy institute at Proskau, 1904 (*Ber. Tät. Milchw. Inst. Proskau, 1904, pp. 22*).—This is a general review of the work of the institute during the year ended April 1, 1904.

Annual reports of the dairymen's associations of the Province of Ontario, 1903 (*Ontario Dairymen's Assocs. Rpts. 1903, pp. 190*).—Among the papers presented at the meetings of the associations of Western and Eastern Ontario, and published here in full, are the following: Chemical Notes for 1903, by W. P. Gamble; Cleanliness and Sanitary Conditions of Factories, by W. G. Medd; Bacteriological Notes on Butter, by F. C. Harrison; The Use of Acidimeter, by F. Herns; Judging Cheese, by R. M. Ballantyne; Defects of Canadian Butter, by P. W. McLagan; The Best Methods of Caring for, Delivering, and Determining the Value of Cream, by J. A. McFeeters; Managing a Herd for Profit, by Adda F. Howie; The Cooling of Curing Rooms, by W. A. Bothwell; Ripening Cream, Churning, and Packing Creamery Butter, by J. C. Bell; The Requirements of the Export Butter Trade, by A. Smith; Experiments in Ripening Cheese at Various Temperatures, by H. H. Dean; The Selection, Care, and Feed of the Dairy Cow, by H. Glendinning; Hints on Ventilation, by J. A. Ruddick; Footprints in the March of Modern Dairying, by T. McGillicuddy; Dairy Instruction at the Agricultural College, by H. H. Dean, and The Transportation of Dairy Products, by J. A. Ruddick. Other articles not included in the above list are noted above.

VETERINARY SCIENCE AND PRACTICE.

Alexins and bactericidal substances of normal serum, Y. PIRENNE (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), Nos. 2, pp. 256–266; 3, pp. 388–397*).—The present investigations were undertaken for the purpose of determining the bactericidal action of rat serum toward anthrax and other organisms, and also whether such action was due to one specific substance or to several causes. It was found that *Bacillus mesentericus*, *B. subtilis*, *B. megatherium*, and *B. mycoides* were as quickly destroyed by rat serum as was *B. anthracis*.

Notes are also given on the effect of heating rat serum, agglutination caused by the serum, filtration, and neutralization of the serum. Normal rat serum possesses, even after heating to 56° C., a bactericidal action of bacilli of the anthrax group. This action is apparently not due to alexins, immune bodies, or agglutinins. In general, however, the bactericidal power of sera is of special importance when it results from the combined action of an alexin and an immune body.

Bacterial hemolysins and antihemolysins, R. KRAUS and B. LIPSCHÜTZ (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 1, pp. 49–67*).—The authors carried on experiments with tetanolysin, staphylolysin, and vibriolysin. The amount of lysin required to dissolve 5 cc. defibrinated rabbit's blood in 0.85 per cent salt solution within 4 hours, at a temperature of 37° C., was taken as the hemolytic dose.

By adding an appropriate quantity of antihemolysin it was found possible to protect red blood corpuscles against the action of the hemolysin. The greater the toxicity of the lysin, the more rapid its injury to the cells, and the greater its affinity for the blood cells the more antihemolysin is required to neutralize it. Comparative experiments with normal and immune antihemolysins showed that these differ only in the intensity of their action and not in their essential nature.

The influence of the stromata and liquid of laked corpuscles on the production of hemolysins and agglutinins, G. N. STEWART (*Amer. Jour. Physiol., 11 (1904), No. 3, pp. 250–281*).—Rabbits and guinea pigs were used as experimental animals in these investigations. It was found that the stromata and hemoglobin-containing liquid of blood corpuscles, after laking by the use of reagents, stimulate

the production of specific hemolytic and agglutinating substances when injected into animals of another species. Blood corpuscles fixed by formaldehyde cause the production of agglutinins and hemolysins and are in turn susceptible to agglutination by specific sera.

Normal agglutinins, R. SCHELLER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 427–441*).—On the basis of his experiments the author concludes that normal horse serum agglutinates typhoid bacilli in dilutions of 1:100. Dead typhoid bacilli are similarly agglutinated at temperatures of 60 to 62° C. Distinction is made by the author between agglutinins and agglutinoids in normal immune sera.

Epizootic lymphangitis, GRAY (*Rhodesian Agr. Jour., 1 (1904), No. 4, pp. 78–80*).—The symptoms and etiology of this disease are briefly described. It is said to be amenable to treatment if taken in time. Carbolic acid and other antiseptics are recommended.

The varieties of Bacillus œdematis maligni, KIRSTEN (*Arch. Wiss. u. Prakt. Tierh., 30 (1904) No. 3, pp. 223–260*).—The purpose of these investigations was to determine whether the bacillus of malignant edema is a sharply defined and invariable species or a group of varieties. The literature of the subject is critically discussed in connection with an extensive bibliography.

The author describes in detail a number of types of this organism as determined by morphological, biological, and pathogenic properties. It is concluded that the edema bacillus, like many other bacterial species, forms a group of varieties which may readily be distinguished. The most of the varieties are only slightly or not at all pathogenic.

A comparison of Klein's yeast with other pathogenic yeasts, E. COHN (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 369–379*).—The experimental investigations with pathogenic yeasts are briefly described. Attention is called to the necessity of giving strict heed to the age and other conditions of yeast cultures in studying their biology and pathogenic action.

Relations of Federal Government to control of contagious diseases of animals, D. E. SALMON (*U. S. Dept. Agr. Yearbook 1903, pp. 491–506*).—The work of this Department in preventing the spread of contagious diseases of animals is outlined with notes on the diseases to which most attention is given, the necessity of the control of contagion by the Federal Government, and the results obtained. Particular attention is given to the discussion of sheep scab, cattle scab, and Texas fever.

Report of the veterinarian, L. VAN ES (*North Dakota Sta. Rpt. 1903, pp. 124–131, pls. 3, figs. 4*).—During the short time the veterinarian has been connected with the station his work has consisted of field and laboratory investigations on various live-stock diseases.

Some active work has been begun, particular attention being paid to the scab or scabies among station cattle. As the conditions at the station are in a large degree similar to those prevailing throughout the State, the methods adopted are described at length. The treatment consists of dipping animals, for which purpose two types of apparatus are in use; one for large herds where the animals are driven through the vat, the other for use on a smaller scale, which consists of a small vat in the ground and movable cage in which the animal is placed and lowered into the tank. The dipping fluid used was a lime and sulphur mixture.

In cooperation with the assistant botanist, experiments were begun to study the effect of the ingestion of *Zygadenus elegans* on animals. A number of cases of stock poisoning have been attributed to this plant and investigations were conducted with a view to determining its poisonous properties. Only a small quantity of the plant could be obtained when the work was done, but with this rabbits were fed or received hypodermic injections of extracts made from the plant. In most cases negative results were obtained and efforts will be made to continue experiments not only on rabbits, but cattle and sheep during the coming season.

The Bacteriological Institute at Landsberg and the preparation and testing of sera, SCHUBERT (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 18, pp. 169–172*).—A detailed account is given of the sera prepared in this institute for use in the treatment of swine erysipelas, swine plague, hog cholera, fowl cholera, and septic pneumonia of calves.

Combating bovine tuberculosis, G. MAZZINI (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), No. 23, pp. 540–544*).—A short outline is presented of various methods which have been suggested for controlling tuberculosis in cattle, including that of von Behring. Attention is called to the danger from consuming the milk and meat of tuberculous animals, and to the necessity of more severe methods in controlling the disease in Italy.

The effect of treatment with hetol upon inoculation tuberculosis of guinea pigs and rabbits, A. HOFFMANN (*Arch. Wiss. u. Prakt. Tierh., 30 (1904), No. 1–2, pp. 162–187*).—The literature relating to the treatment of tuberculosis by the use of hetol is critically reviewed. The chemical nature of hetol is discussed. In healthy rabbits and guinea pigs hetol in doses of 1 cc. of a 1 per cent solution produced slight elevation of temperature.

It was found that animals inoculated with tuberculosis and treated with hetol withstood infection considerably longer than the control animals. Striking differences were observed in the histological characters of the tissues of treated and untreated animals. In treated animals the tubercles were small, sharply delimited, and surrounded by leucocytes. Furthermore, treated animals gained in weight while untreated ones lost. Hetol may without any injurious effect be given to rabbits and guinea pigs hypodermically or intravenously in ½ per cent to 1 per cent solutions in doses of 1 cc.–2 cc. It is more effective when given intravenously than by the hypodermic method.

The author considers hetol a very satisfactory remedy and believes that it materially aids the animal in resisting the progress of tuberculosis.

Erroneous diagnosis of tuberculosis in cows, LIÉNAUX (*Ann. Méd. Vét., 53 (1904), No. 6, pp. 339–343*).—A milch cow showed loss of appetite and weight, with body temperature of 40° C. The case was diagnosed on the basis of physical symptoms as tuberculosis. On post-mortem examination the lungs were found to be free from tubercles. The case proved to be one of infectious lymphadenitis. Detailed notes are given on the pathological lesions.

The tuberculin reaction, FEISTMANTEL (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 406–415*).—The toxic effect of large doses of glycerin has little or no influence in the production of a reaction to tuberculin in guinea pigs. Salt solutions are similarly without effect. It was found that from cultures of *Streptothrix farcinica* a toxin could be obtained which had the same action as tuberculin. The tuberculin reaction is therefore considered of a generic rather than specific character. The tubercle bacillus and *Streptothrix farcinica* are believed to be closely related.

Rhodesian tick fever, A. THEILER (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 421–438, pl. 1*).—The nature, symptoms, etiology, and pathology of this disease are described in considerable detail. The disease can not be transmitted by a single inoculation of virulent blood. The developmental stages of the blood parasite are described and notes are given on the biology and habits of *Rhipicephalus appendiculatus*, by means of which the disease is transmitted. The disease is carried only by the nymphal and adult stages of this tick. Treatment of Rhodesian tick fever is of no avail, but immunity may be produced by inoculation.

Rhodesian redwater, R. KOCH (*Arch. Wiss. u. Prakt. Tierh., 30 (1904), No. 3, pp. 281–319*).—This is essentially a German translation of the author's first three reports on this subject as already noted from English publications (E. S. R., 15, pp. 301, 1014, 1126).

The tick disease of cattle (hæmoglobinæmia ixodioplasmatica boum) in German and English East Africa and Uganda, A. SCHMIDT (*Arch. Wiss. u. Prakt. Tierh., 30 (1904), No. 1-2, pp. 42-101*).—The literature of this subject is discussed with references to a bibliography of 221 titles. An elaborate review is given of the history, symptoms, pathogenesis, etiology, and treatment of the disease. The developmental stages of the blood parasites are described and notes are given on the natural history of the ticks. The author argues that one set of quarantine regulations would be effective in controlling Texas fever, rinderpest, and tsetse-fly disease.

Trypanosoma theileri in German East Africa, O. PANSE (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 3, pp. 376-378, fig. 1*).—Specimens of an organism supposed to belong to this species were found in cattle on the island of Mafia. Notes are given on its morphological characters.

An African trypanosome pathogenic for horses, A. LAVERAN and F. MESNIL (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 12, pp. 732-737, fig. 1*).—Notes are given on the morphological characters of *Trypanosoma dimorphon*. This parasite is pathogenic for rats, mice, rabbits, dogs, goats, horses, etc.

Some of the more recent work on the morphology of anthrax bacillus, A. GRIMME (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 352-354*).—The author gives a brief review of recent literature on this subject. The fat globules of anthrax bacilli are spherical, highly refractive, and do not stain with ordinary anilin dyes. They are dissolved in chloral hydrate but not in Eau de Javelle.

Correction to the article of D. Ottolenghi "On the minute structure of anthrax bacillus," V. RUZICKA (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, p. 354*).—A controversial article regarding the staining of anthrax bacillus.

The mechanism of natural immunity to anthrax, L. REMY (*Bul. Inst. Chim. et Bact. Gembloux, 1904, No. 74, pp. 1-32*).—A long series of experiments was carried out for the purpose of determining the bodies in the serum of white rats, rabbits, guinea pigs, goats, and horses.

On the basis of these experiments the author concludes that natural immunity is subject to the same laws which regulate artificial immunity. The bactericidal power of normal sera should not be attributed to the alexin entirely, but partly to the immune body. The author considers artificial immunity not as a means of defense on the part of the affected organism, but as an exaltation of the process of destructive digestion of pathogenic bacteria. The destruction of bacteria by means of sera in vitro is comparable with the artificial digestion of proteid substances.

The artificial immunity of rabbits to anthrax, O. BAIL (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 397-406*).—The serum of immunized rabbits may be rendered practically inactive against anthrax bacilli by admixture of cellular material. The addition of bone-marrow cells, however, brings about the death or attenuation of the anthrax bacilli. The immune serum appears to be not bactericidal but rather antitoxic.

Blackleg, C. BIANCHI (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), No. 21, pp. 481-485*).—A brief account is presented of the symptoms and treatment of blackleg. The causes of death after vaccination are discussed.

The bacterial content of muscle tissue affected with blackleg and of blackleg vaccine, H. REGN (*Arch. Wiss. u. Prakt. Tierh., 30 (1904), No. 3, pp. 261-280*).—An attempt was made to determine quantitatively and qualitatively the blackleg bacilli in musculature and vaccine. The author made numerous aerobic and anaerobic cultures on various media and inoculation experiments with animals. The number of spores in blackleg muscles was found to vary enormously, being most numerous in spontaneous cases, in which a maximum of 1,202,000 per mg. was observed.

In experimental anthrax in cattle the number of spores varied from 215 to 133,000 per mg. of affected muscle, and in sheep from 410 to 2,100. The number of spores varies

with the age of the material, being less in older material. Attenuation of the material diminished the number of spores. Several species of saprophytic organisms were found in blackleg vaccine. Some of these are usually found in healthy cattle.

Vaccination against blackleg by the method of O. Thom s in Verdun, A. GUILLEBEAU (*Schweiz. Arch. Tierh., 46 (1904), No. 2, pp. 57-61*).—The author refers to the recent introduction of "blacklegine" into Germany and to the claims which have been made regarding its efficacy. The experience thus far had with this method does not seem sufficient, and the author prefers to wait for further data before coming to a final conclusion as to the value of the remedy.

Foot-and-mouth disease, GRAY (*Rhodesian Agr. Jour., 1 (1904), No. 4, pp. 83, 84*).—The author describes the symptoms and lesions of this disease in various animals, including camels.

Intravenous treatment of foot-and-mouth disease, G. MAZZINI (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), Nos. 2, pp. 31-37; 4, pp. 79-84; 6, pp. 131-136; 8, pp. 175-182; 9, pp. 200-203*).—A summary is presented of the results obtained in the intravenous use of corrosive sublimate in treating foot-and-mouth disease in France, Germany, Belgium, Roumania, Switzerland, Spain, Portugal, and Italy. From this elaborate review of the literature of the subject it is concluded that the method is worthless.

The pathogenic action of certain Streptothrix (Actinomycosis) species, F. SAUFELICE (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 355-367*).—The author presents a systematic classification of this group of micro-organisms, with notes on the pathogenic action of various species. It was found to be impossible to obtain by inoculation of dogs a serum which would increase the resisting power of rabbits to infection with actinomycosis.

Hematuria in cattle, DETROYE (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 6, pp. 187-193*).—Positive results were obtained in 10 out of 17 cases in which it was sought to transmit the disease by direct inoculation. Detailed notes are given on the technique of these experiments.

Malignant catarrhal fever of cattle, ISEPPONI (*Schweiz. Arch. Tierh., 46 (1904), No. 1, pp. 1-12*).—An outbreak of this disease occurred in which the symptoms were not of the usual nature. From his study of the disease the author concludes that it occurs sporadically or sometimes as an enzootic.

The disease may be mistaken for foot-and-mouth disease, rinderpest, meningitis, and dysentery. It is apparently not communicable immediately from animal to animal. The pathogenic organism is found in the soil, where it retains its virulence for long periods. When affected animals are killed before the croupous-diphtheritic symptoms appear the meat is suitable for food. The disease is fatal if allowed to reach full development. It may be controlled by quarantine, thorough disinfection, and serum treatment.

Inoculation against pleuro-pneumonia, sequels and complications, A. THEILER (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 357-368, pl. 1*).—An elaborate historical account is given of the methods of inoculation against this disease. The methods of vaccination are described and notes are given on their effect upon healthy cattle. Complications from inoculation are often manifested by lesions in the throat, peritoneum, or elsewhere. In the author's experience the duration of artificial immunity is about 1 year, occasionally 18 months.

Trichophyton tonsurans of cattle, POËNARU (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 10, pp. 328, 329*).—This disease may be transmitted from cattle to man, but such is not commonly the case. The author classifies *Trichophyton tonsurans* with the yeasts.

The operative treatment of skin warts on cattle, M. STREBEL (*Schweiz. Arch. Tierh., 46 (1904), No. 1, pp. 12-17*).—Warts appear most frequently on young cattle, and preferably on the udder, inner surface of the thighs, and lower parts of the

abdomen. These warts may be classified into two groups, one group containing hard, horny outgrowths and the other containing softer tumors of various sizes beneath the skin. In the treatment of warts the author believes that surgical removal is far more satisfactory than the external application of caustic drugs.

Milk fever; its simple and successful treatment, J. R. Mohler (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 45, pp. 13, figs. 2*).—Milk fever is described with particular reference to its cause, symptoms, distribution, pathological anatomy, prognosis, and treatment. The various lines of treatment which have been applied to this disease are described. Perhaps the simplest and most effective remedy consists in the distension of the udder with filtered atmospheric air.

At the suggestion of the author a convenient apparatus was devised for injecting air into the udder. The operation can be done by the ordinary dairyman, but it is recommended that, where possible, veterinarians be called. In preventing the development of milk fever, Epsom salts in 1-lb. doses may be administered for 2 or 3 days before calving, and some milk may be left in the udder at each milking for the first few days after calving.

Pathogenesis and treatment of milk fever, Hebbelynck (*Ann. Méd. Vét., 53 (1904), No. 1, pp. 16–25*).—The different theories regarding the etiology of milk fever are briefly discussed. The author inclines to the view that the disease will ultimately be found to be due to a pathogenic organism, and expresses the hope that a successful serum treatment may be devised.

Treatment of milk fever, N. F. Andreev (*Arch. Vet. Nauk. St. Petersburg, 34 (1904), No. 4, pp. 320, 321*).—An account is given of the treatment of milk fever by Schmidt's method and with atmospheric air. The author tested the latter method in 4 cases with very satisfactory results. The cows were able to stand up within 1 to 2 hours after treatment.

Investigation of "yellow galt," E. Zschokke (*Schweiz. Arch. Tierh., 46 (1904), No. 3, pp. 113–126*).—Statistics are given on the frequency of this mammary disease which appears to be enzootic in certain localities. The cause of the disease is infection with streptococci. The mode of infection is, however, not well understood. Cows inoculated in the milk cistern with pure cultures of streptococci showed elevation of body temperature, decrease in milk secretion, and pus corpuscles in the milk. No successful treatment of the disease has been devised, and attention is called to the urgent need of further investigation along this line.

Obstructions to the flow of milk, G. Giovanoli (*Schweiz. Arch. Tierh., 46 (1904), No. 1, pp. 20–22, fig. 1*).—A brief discussion of various causes of obstruction of the milk flow, due to pathological conditions of the udder or teats.

Some results from spaying milch cows, J. Jacobs (*Ann. Méd. Vét., 53 (1904), No. 2, pp. 73–83, figs. 2*).—A description is given of various instruments used in performing this operation. The method adopted was that of ligation of the oviduct without removal of the ovaries. The milk flow was maintained and the procedure is recommended as a wise practice.

Spaying milch cows, Degive (*Ann. Méd. Vét., 53 (1904), No. 1, pp. 1–16, pl. 1*).—The somewhat unsatisfactory results thus far obtained in spaying cattle are explained as due to the use of improper methods of operation. It is recommended that the operation be performed only on cattle in health and 8 or 9 hours after their last feed. Strict antiseptic precautions are urged. The oviducts may be successfully ligatured with silk thread.

Pseudo-epizootic abortion, Cagny (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 10, pp. 320–322*).—Brief notes on pathological conditions which may be mistaken for this disease.

Infectious arthritis of calves, E. Thierry (*Jour. Agr. Prat., n. ser., 7 (1904), No. 18, p. 584*).—In preventing this disease it is recommended that the navel be dis-

infected by washing with a solution of iodin and iodid of potash followed with an alcoholic solution of iodin.

A case of cerebro-spinal meningitis in a calf, B. ANTONIO (*Gior. R. Soc. ed. Accad. Vet. Ital., 53 (1904), No. 17, pp. 396-398*).—A calf 20 days old developed a marked case of cerebro-spinal meningitis, resulting in death. A body temperature of 41° C. was reached. This case was believed to be one of the bacterial forms of the disease. The meninges were much injected and the lungs congested.

Alleged indiscriminate inoculation of cattle (*Rhodesian Agr. Jour., 1 (1904), No. 4, pp. 73-78*).—A thorough discussion is presented of certain reports regarding unsatisfactory results from inoculation of cattle by private individuals and persons of insufficient training. No bad results have occurred where inoculated stock have been kept under proper care and isolation and where the inoculation process has been properly carried out.

Scabies in sheep and cattle and mange in horses, L. VAN ES (*North Dakota Sta. Bul. 61, pp. 399-435, figs. 24*).—Detailed notes are given on the cause, symptoms, distribution, diagnosis, and treatment of sheep scab. The lime-sulphur dip is recommended as one of the most effective means of curing the disease. It is held that this dip causes no serious harm to the wool.

Directions are given for preparing and applying the dip, and for the preparation of dipping plants for the treatment of cattle scab. The lime-sulphur dip is recommended for this disease also, in the proportion of 21 lbs. sulphur and 16¾ lbs. lime per 100 gal. of water. The temperature of the dip should be between 102° and 112° F., in order to insure the best results. The treatment suggested for mange in horses consists in removing the scabs from affected parts and applying creolin or some other insecticide. Horses can not be dipped so successfully as cattle or sheep.

Verminous broncho-pneumonia of sheep, G. SAINT-HILAIRE (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 8, pp. 173-179*).—In 1903 this disease prevailed extensively in the northern part of Algeria. The parasites concerned were *Strongylus filaria* and *S. rufescens.* Notes are given on the symptoms, pathology, and treatment of the disease. Various methods of inhalation of fumes and intratracheal injections for the treatment of the disease are described.

Results of experiments with nodule disease of the intestines of sheep, W. H. DALRYMPLE (*Louisiana Stas. Bul. 79, 2. ser., pp. 16, figs. 2*).—The symptoms and pathological lesions of nodule-disease in sheep are briefly described.

The author conducted a number of experiments for the purpose of determining the method of infestation of sheep with this worm and also methods of eradicating the worm from infested pastures. It was found during these experiments that infested sheep may distribute the worms upon clean pastures and transmit infection to healthy sheep which may subsequently graze upon these pastures. When infested pastures are plowed and cultivated for a single season the infestation may be destroyed and lambs may safely be allowed to graze upon this land when subsequently allowed to run to pasture. The offspring of infested ewes may be raised in a healthy condition upon the exercise of proper precautions.

It was suggested that while this disease appears to be widely distributed throughout nearly all of the old pasture lands used for sheep, it might be eradicated by plowing and cultivation of such pastures and the destruction of the intestines of the infested sheep.

Swine plague, W. GRIPS ET AL. (*Fortschr. Vet. Hyg., 2 (1904), No. 4, pp. 113-135*).—It is maintained that the organism discovered by Grips and not the one discovered by Löffler is the cause of swine plague, which is considered a purely contagious disease of young hogs characterized by catarrh and suppurative processes. Infection usually takes place by way of the mouth. The Löffler bacillus is merely instrumental in causing acute complications. Distinction is made between swine erysipelas, swine plague, and hog cholera.

Shall veterinarians continue to vaccinate with cultures of swine erysipelas? KLEINPAUL (*Berlin. Tierärztl. Wchnschr., 1904, No. 16, pp. 303–306*).—Some writers on this subject have contended that vaccination with serum and culture of swine erysipelas is no protection against the disease but, on the contrary, contributes to its wider distribution. The author states, however, that hog raisers have found such vaccination necessary in order to secure a profit from the hog industry. Attention is called to the very important and reliable results obtained in the control of swine erysipelas by this method. The disease is not spread by vaccination. The method has only one disadvantage, viz, that the immunity thus produced is of short duration.

Report on pig disease in the Umtali district, G. V. S. JARVIS (*Rhodesian Agr. Jour., 1 (1904), No. 6, pp. 176, 177*).—The disease prevails most extensively during the rainy season. The rate of mortality is high. The symptoms and lesions are described in detail. Sty-fed hogs are seldom affected. Several species of ticks were found on diseased hogs. The affection does not appear to be contagious.

Sarcoptic mange in hogs, A. SCHOLL (*Ann. Méd. Vét., 53 (1904), No. 5, pp. 284–290*).—The symptoms of hog mange as caused by infestation with *Sarcoptes scabiei suis* are described and notes are given on the course of the disease, its distribution, transmission to other animals and man, and its treatment.

The leucocytes of horse blood, BIDAULT (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 10, pp. 315–317*).—An elaborate review of this subject, together with personal investigations by the author, is considered to be of great value by the Veterinary Commission of France.

Horse sickness experiments, A. THEILER (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 332–334*).—Recovered animals are immune to the disease. Immunity may also be produced by simultaneous injection subcutaneously of serum and virus. The most certain and effective immunity, however, is produced by simultaneous injection of virus intravenously and serum subcutaneously. The duration of the inoculation is about 12 days.

Glanders in German East Asia, SCHLIE (*Berlin. Tierärztl. Wchnschr., 1904, No. 13, pp. 238, 239*).—A description is given of the clinical history and pathological lesions of glanders cases in a horse and a mule. The usual quarantine and disinfection measures were enforced in order to prevent the further spread of the disease among other army horses.

Hasty diagnosis in the case of horses suspected of glanders, A. DI GIROLAMO (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), No. 9, pp. 194–200*).—It is recommended that all suspected horses be properly quarantined and premises disinfected, after which a reliable diagnosis may be made.

The antiseptic action of glycerin and methyl violet on the glanders bacillus, G. ANGELICI (*Rec. Méd. Vét., 81 (1904), No. 1, pp. 14–18*).—Virulent cultures of the glanders bacillus were shaken up in sterile glycerin and left standing at various temperatures. It was found that the virulence was entirely destroyed after an exposure of 4 to 6 days, as determined by inoculation experiments with rabbits and guinea pigs. Methyl violet (5 parts to 1,000) destroyed the virulence of *Bacillus malleus* and *B. pyocyaneus* after exposure for 40 to 50 days.

Dourine and its treatment, E. MARCHAL (*Rec. Méd. Vét., 81 (1904), No. 7, pp. 231–237*).—Continued experiments have corroborated the author's previous work in showing that dourine may be successfully treated with cacodylate of soda. When given by way of the mouth this remedy may be decomposed into somewhat irritant and toxic substances. It is advisable therefore to administer the drug subcutaneously. The author treated six cases in horses, in which the characteristic symptoms were present and trypanosomata in the blood, as shown by inoculation of dogs. Of these 6 horses, 5 made a complete recovery. The author therefore considers the remedy a very satisfactory one for the treatment of dourine.

Etiology, pathogenesis, and treatment of equine paraplegia, PÉRICAUD (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 4, pp. 55–58*).—This disease is also known under the name hemoglobinemia. Notes are given on several cases in which the author obtained good results from treatment with a mixture containing 5 parts potassium chlorid, 1 part potassium sulphate, 2 parts basic phosphate of potash, 1 part basic phosphate of soda, and 1 part soda. The mixture is injected subcutaneously.

Colic in horses (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 4, pp. 59–80*).—This is a sort of symposium on the subject and contains clinical notes and discussions on numerous cases with an account of the etiology of the disease and the most promising lines of treatment.

Cerebral tumors in horses, R. BISSAUGE and NAUDIN (*Rec. Méd. Vét., 81 (1904), No. 1, pp. 5–9*).—A brief general account of cerebral tumors is given, together with detailed notes on a case which came under the author's observation. The horse had frequent attacks of cerebral congestion and depression without fever. Cold applications and purgatives were given with apparently good results. The animal finally had to be killed and notes are presented on the lesions observed during the post-mortem examination.

Perforative epithelioma of the upper jaw in the horse, G. GANCOLA (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), Nos. 1, pp. 10–13; 2, pp. 25–31; 3, pp. 57–63, figs. 3*).—The author discusses the various theories which have been proposed to explain the etiology of malignant tumors. Notes are given on the structure of maxillary epithelioma as observed in horses.

Poultry diseases, G. ANGELICI (*Gior. R. Soc. ed Accad. Vet. Ital., 53 (1904), No. 5, pp. 110–114*).—Spirillosis of fowls was found to be transmissible by inoculation with virulent blood or fresh serum. Immunity may be brought about by recovery from a mild attack of the disease or by inoculation with serum containing dead spirilla. Experiments are reported on the passage of fowl cholera organisms through filters. Brief notes are also given on tumors of fowls.

The diagnosis of rat plague, KISTER and P. SCHMIDT (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 3, pp. 454–457, pl. 1*).—Ferrets used in the destruction of rats developed a disease which rapidly killed large numbers of them. From cases of this disease an organism was isolated which resembled the plague bacillus and which proved to be pathogenic for all ordinary experimental animals. Agglutination tests showed that the micro-organism is specifically distinct from the plague bacillus.

The use of ichthargan in veterinary practice, J. JOST (*Berlin. Tierärztl. Wchnschr., 1904, No. 14, pp. 257–259*).—The author used ichthargan per os, externally, and intravenously in the treatment of morbus maculosus, septicemia, fistulous withers, enteritis, dog distemper, and other diseases. Ichthargan proved much more effective than colloidal silver in cases of morbus maculosus. When given in cases of septicemia, the drug caused a prompt lowering of the temperature and healing of the skin wound by granulation. In the gastric form of dog distemper ichthargan per os had a markedly beneficial effect.

Adulterated linseed oil for veterinary purposes, P. SCHWEITZER (*Missouri Sta. Rpt. 1903, pp. 27, 28*).—An oil which had been sold for linseed, and which caused the death of cattle to which it had been administered as a medicine, was found to contain lead, naphtha, resin oil, and other oils than linseed, showing that the material was an impure boiled oil.

Comparative study of the antiseptic action of different alcohols, G. WIRGIN (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 1, pp. 149–168*).—The different alcohols were tested to determine their antiseptic power toward *Micrococcus pyogenes aureus*. It was found that their action varied as their molecular weight, methyl alcohol being least and amyl most active. Isomeric alcohols are nearly equal in antiseptic power. The hemolytic action of alcohols also varies as the molecular weights. None of the alcohols kills spores at ordinary temperatures. The most

powerful alcoholic mixtures are more active than a 4 per cent solution of boric acid or a 2 per cent solution of zinc sulphate.

AGRICULTURAL ENGINEERING.

Water resources of the Salinas Valley, California, H. HAMLIN (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 89, pp. 91, pls. 12, figs. 30*).—"This report is based on investigations made by the United States Geological Survey, cooperating with the board of supervisors of Monterey County and the California Water and Forest Association, in Monterey County, Cal., during 1900, 1901, and 1902. The work was done under the supervision of Mr. J. B. Lippincott, resident hydrographer of the United States Geological Survey.

"The report relates particularly to that portion of the Salinas Valley that lies within the boundaries of Monterey County, and describes the topography, hydrography, and economic geology of a portion of the region. It also discusses the extent of the underground water, the methods of irrigation, the irrigation systems, and the possibility of extending irrigation by the utilization of surface streams and by impounding flood waters."

Geology and water resources of part of the lower James River Valley, South Dakota, J. E. TODD and C. M. HALL (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 90, pp. 47, pls. 23*).

Review of irrigation investigations for 1903, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 469–502, pls. 6*).—A résumé is given of irrigation investigations during the year in various States in the arid, semi-arid, and humid portions of the United States, with brief accounts of drainage investigations in different parts of the United States and of studies of laws and social institutions of irrigated regions in the United States and Italy, a statement regarding the collection and publication of information as to methods employed in the practical operations of irrigation farming, and a list of publications issued during the year.

Preparing land for irrigation, R. P. TEELE (*U. S. Dept. Agr. Yearbook 1903, pp. 239–250, pls. 2, figs. 5*).—A description is given of methods actually in use in the irrigated region for removing sagebrush and stones, smoothing and leveling land, locating and building farm laterals, and preparing land for irrigation by the check system and for the use of metal pipes and canvas hose.

Irrigation in the valley of Lost River, Idaho, A. E. WRIGHT (*U. S. Dept. Agr., Office of Experiment Stations Circ. 58, pp. 24*).—The results of sinkage measurements during August, 1903, at different points on this river, which sinks in its bed and rises again to the surface several times in its course, are summarized and discussed with reference to irrigation practices and water rights.

Railway embankments and irrigation, K. A. WIDEGREN (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 43–46, fig. 1*).—The possibility, advantages, and means of utilizing railway embankments as dams for storage of water for irrigation are briefly discussed.

Seepage investigations in the valley of the Laramie River, B. P. FLEMING (*Wyoming Sta. Bul. 61, pp. 32, figs. 3*).—The nature, extent, and means of prevention of seepage losses are discussed. Seepage measurements on the Laramie River as it passes through the Laramie Plains, on several canals which divert water from the river, and on Sand Creek, are reported. The results are summarized as follows:

"(1) The Laramie River throughout its length gains a varying, but always appreciable, amount of water by seepage from adjoining lands, the gain averaging 0.42 second feet per mile, the highest gains being 1.00 second foot per mile, near Woods Landing, and the lowest 0.06 per mile, below Reservoir No. 2.

"(2) All the canals investigated show large losses by seepage, the largest losses occurring on the highline canals, the smallest on the canals in the river bottoms.

"(3) The average loss per mile from canals, excluding the Divide Ditch, amounts to 5.79 per cent of the volume carried per mile, or 1.08 second feet per acre of wetted perimeter. The highest losses in terms of the volume carried occurred on the Divide Ditch and Highline Canal, amounting, respectively, to 50.2 per cent and 17.5 per cent.

"(4) It is probable that seepage has a greater influence in sustaining stream flow, and consequently in increasing the acreage of land irrigated, than is commonly known. As shown from results on Sand Creek and the Laramie River, the same water is undoubtedly diverted and used many times in succession."

Drainage conditions in Iowa, W. H. STEVENSON, G. I. CHRISTIE, and L. E. ASHBAUGH (*Iowa Sta. Bul. 78, pp. 237–263, figs. 4*).—This bulletin contains a discussion of the need and advantages of drainage in Iowa, based on results of an extended investigation of drainage conditions in the State, with notes and tables showing the grades and sizes of drains to be used under different conditions, the cost of tile drains, and forms of contracts and specifications for drainage. The order of procedure under the new State drainage law is also explained.

It is stated that "over four million acres of Iowa land would be greatly benefited by tile drainage. A very large percentage of this number was wholly unproductive last year. The direct financial loss to the State last season through lack of adequate drainage was approximately $20,000,000. The rapid rise in land values makes tile drainage imperative; it also makes it a profitable investment. Under-draining benefits rolling lands. It prevents the loss of the most valuable part of the soil through washing and by removing the surplus ground water prevents seepage. . . . By facilitating the cultivation and harvesting of otherwise broken fields drainage lessens the cost of crop production. Rotation of crops is essential to successful farming. On thousands of farms throughout the State well-planned, systematic drainage can alone make this possible."

Supplemental report on drainage in the Fresno district, California, C. G. ELLIOTT (*U. S. Dept. Agr., Office of Experiment Stations Circ. 57, pp. 5, fig. 1*).—This circular, which is supplementary to No. 50 of this Office (E. S. R., 15, p. 94), summarizes the results of observations in a series of 7 wells which were sunk to a depth of 8 ft. in the drained area for the purpose of studying the movement of the soil water. The bearing of the results upon the efficiency of the drainage system previously described is discussed.

Progress of road building in the Middle West, R. W. RICHARDSON (*U. S. Dept. Agr. Yearbook 1903, pp. 453–462, pls. 3*).—The topics discussed in this article are forces at work for highway improvement, the rural population and the roads, reasons for lack of progress in road building, State and National aid, antiquated methods, road laws and conditions in several States, road material, road construction, and educational work.

Building sand-clay roads in southern States, W. L. SPOON (*U. S. Dept. Agr. Yearbook 1903, pp. 259–266, pls. 2, figs. 3*).—Several examples of typical sand-clay roads are described and the methods of constructing them are explained. It is claimed that "the building of sand-clay roads has passed the experimental stage, and it is no longer a question of doubtful procedure.

"The important things to be borne in mind are thorough mixing to the saturation point, and then properly shaping and rolling the road. This mixing is usually done by the traveling public. This is the critical period in the construction of a sand-clay road, because care must be taken to secure an even amount of puddling, so that all the lumps of clay shall be broken and saturated with sand to a depth of 8 to 10 in. If this can be done and the road is properly crowned as it dries, there can be no doubt about the result being eminently satisfactory.

"This mixing might be done by the use of plows and harrows when the clay is wet, but it is customary to let teams and vehicles accomplish it. It is true that the

condition of the road becomes worse for a while during the puddling operation; but after this is effected and sufficient sand has been added relief is permanent."

The value of different motive powers in agriculture, H. HOLLDACK (*Fühling's Landw. Ztg., 53 (1904), No. 14, pp. 509–518, figs. 8*).—This article describes and discusses the efficiency of the steam turbine motor.

Trials of mowers and selfbinders at Alnarp, G. TIMBERG (*Landtmannen, 14 (1903), No. 37, pp. 578–582*).—Four machines of 3 different makes were included in the trials.

Trials of cultivators, planters, and feed mills at Alnarp, G. TIMBERG (*Landtmannen, 14 (1903), No. 38, pp. 593–597*).

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1903 (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 758, pls. 60*).—This contains the usual report on the work and expenditures of the agricultural experiment stations in the United States; annual reports of the experiment stations in Alaska, Hawaii, and Porto Rico; reviews of irrigation and nutrition investigations, and several other articles abstracted elsewhere in this issue.

Included in the report on the work and expenditures of the stations are statistical summaries; brief reports of nutrition and irrigation investigations; summarized accounts of the meetings of the Association of American Agricultural Colleges and Experiment Stations and the American Association of Farmers' Institute Workers; a review of the work of this Office; a report of the governing board, station, staff, general outline, lines of work, income, and publications of each experiment station; a list of station publications received by this Office during 1903; federal legislation, regulations, and rulings affecting agricultural colleges and experiment stations, etc.

Yearbook of the Department of Agriculture, 1903 (*U. S. Dept. Agr. Yearbook 1903, pp. 728, pls. 65, figs. 54*).—The Yearbook, as in the past, contains a general report on the work of the Department during the year by the Secretary of Agriculture; numerous semipopular articles, and an appendix consisting of a summary of information on various subjects of interest to the farmer. The 32 articles included in the present Yearbook are noted elsewhere in this issue. The proposed new buildings of the Department of Agriculture are described by B. T. Galloway, chairman of the building committee.

Annual Report of Missouri Station, 1899 (*Missouri Sta. Rpt. 1899, pp. 7*).—This contains a brief report of the director and a financial statement for the fiscal year ended June 30, 1899.

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Annual Report of Missouri Station, 1903 (*Missouri Sta. Rpt. 1903, pp. 31*).—This contains a brief report of the director; a financial statement for the fiscal year ended June 30, 1903, and several articles noted elsewhere.

Fourteenth Annual Report of North Dakota Station, 1903 (*North Dakota Sta. Rpt. 1903, pp. 254*).—This includes the organization list of the station; a brief report of the director; somewhat extended reports of the heads of departments, noted elsewhere; a financial statement for the fiscal year ended June 30, 1903, and a reprint

of Bulletin 59 of the station, entitled Trees and Fruits in North Dakota (E. S. R., 15, p. 971).

Thirteenth Annual Report of Utah Station, 1902 (*Utah Sta. Rpt. 1902, pp. LVIII*).—This contains a report of the director; departmental reports, and a financial statement for the fiscal year ended June 30, 1902. The report of the agronomist giving the results of some experimental work is noted elsewhere. The other reports are brief reviews of the different lines of station work.

Proceedings of the seventeenth annual convention of the Association of American Agricultural Colleges and Experiment Stations held at Washington, D. C., November 17-19, 1903, edited by A. C. TRUE, W. H. BEAL, and H. C. WHITE (*U. S. Dept. Agr., Office of Experiment Stations Bul. 142, pp. 196, dgms. 3*).—An account of this convention has already been given (E. S. R., 15, p. 322).

Bibliographia agronomica universalis, E. OTTAVI, A. MARESCALCHI, ET AL. (*Casale: Ottavi Bros., 1903, Nos. 2, pp. 57–128; 3, pp. 129–176; 4, pp. 177–264*).—This is a continuation of the bibliography previously noted (E. S. R., 15, p. 418). The 4 numbers published contain 2,094 titles. An authors' index is appended to number 4.

A model farm, W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1903, pp. 363–370, pls. 2*).—This is an account of the management of a 15-acre farm in southeastern Pennsylvania. The farm raises all the roughage for 30 head of stock, 17 of which are milch cows. During the first 7 years that the farm was in possession of the present owner it paid a mortgage of $7,200. The author concludes that the most important lesson to be learned from the achievements of this farmer is that by applying such methods as were used, it is possible to cause land to yield twice or three times as much as the present average from what are considered good methods.

"The most important single feature of this farm, aside from the remarkably systematic way in which it is conducted, is the manner of handling the manure. The fact that the stock are all stabled the year round makes it possible to save all the manure, both liquid and solid, and apply it to the land. Again, the fact that it is applied daily, as produced, insures that any leaching by rains shall carry the leached materials into the soil, where it is wanted. How much plant food is lost from fermentation after the manure is spread on the fields is not known. But the remarkable yields of every portion of this farm would seem to indicate that this method of handling manure is highly satisfactory.

"That similar results as to yield of crops may be accomplished by the use of commercial fertilizers, combined with crops grown expressly for the production of humus, is shown by the experience of a number of farmers, particularly in the truck-growing districts. It may, therefore, prove possible to develop almost any type of farming to a point that will more than double present average yields if agricultural science continues to develop as rapidly during the next quarter of a century as it has during the last."

The nation's farm surplus, G. K. HOLMES (*U. S. Dept. Agr. Yearbook 1903, pp. 479–490*).—A statistical review of the export trade of the United States is summarized by the author as follows:

"The vast total of exports is composed mostly of cotton, grain and grain products, and meat and meat products, with places of much less although of large importance taken by tobacco, live animals, oil cake and oil-cake meal, fruits and nuts, and vegetable oils. With attention concentrated upon three or four, or at most upon all these eight classes of products as exports to the countries of the earth, it may be still further concentrated upon the United Kingdom as receiving one-half of all this country's exports of farm products, and, in a less degree, upon Germany, the recipient of one-sixth, all other countries being individually of minor importance in the general survey.

"So it becomes easy to find our principal competitors, which are, in meats and meat products, Australasia, Argentina, and Canada, and Denmark in bacon; in live animals, Argentina and Canada; in grain and grain products, Argentina, Russia, Canada, and

Roumania, and at times British India and Australasia; in tobacco, the Dutch East Indies; while in cotton the other countries of the earth have not yet produced a direct competitor of the upland varieties grown in this country."

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, Nos. 1, pp. 1–8; 2, pp. 9–16; 3, pp. 17–24*).—These numbers for May, June, and July, 1904, contain the usual statistical reports on the crops in the United States and foreign countries.

A reconnoissance of Samoa, F. Wohltmann (*Samoa Erkundung 1903. Berlin: Kolonial Wirtschaftliches Komitee, 1904, pp. VI+164, pls. 20, figs. 9, maps 2*).—A report is given of the investigations of the author on the climate, soils, and agricultural and other economic conditions of the German Samoan Islands. Particular attention is given to the agricultural conditions, the cultivation of cacao being described in considerable detail.

A chapter is devoted to the subject of plant diseases, and attention called to the desirability of treating many of the plants for the existing diseases and quarantine regulations against the introduction of additional pests.

Progress in agricultural education, 1903, A. C. True (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 571–634, pls. 24*).—This article treats of the educational work of the Department of Agriculture, the Office of Experiment Stations, and the Association of American Agricultural Colleges and Experiment Stations; including in the discussion a report on school gardens and a reprint of the report of the committee on methods of teaching agriculture (E. S. R., 15, p. 325).

The article also reviews the work being done by the agricultural colleges, secondary schools, and primary schools. In discussing the agricultural colleges particular attention is paid to the courses in rural engineering and rural economy, courses offered in the latter subject in European agricultural schools being included. New buildings at some of the stations are described. The article concludes with a reprint of a circular of the Office giving a selected list of books on nature study and elementary agriculture.

Agricultural economics as a subject of study in the agricultural college, K. L. Butterfield (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 713–718*).—The importance of agricultural economics as a subject of study is emphasized, and an outline is given for a short lecture course on this subject.

Instruction in agriculture in land-grant colleges and schools for colored persons, D. J. Crosby (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 719–740, pls. 7*).—Information on this subject is presented by States, and some general conclusions are drawn in regard to the character of the work and the needs of the institutions. An article on the methods and facilities for instruction at the Hampton Normal and Agricultural Institute, by C. L. Goodrich, is included.

Development of the text-book of agriculture in North America, L. H. Bailey (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 689–712*).—Comments are made on the principal agricultural text-books which have appeared in the United States, and a complete list of such text-books, arranged chronologically, and containing the table of contents in each instance is appended.

Farmers' institutes in the United States, J. Hamilton (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1903, pp. 635–687*).—This is a report on the farmers' institutes in the different States and Territories, with summarized statistics and a general discussion of the work as a whole.

The farmers' institutes, J. Hamilton (*U. S. Dept. Agr. Yearbook 1903, pp. 149–158*).—This treats in a general way of the development and present status of the farmers' institute movement in the United States.

Farmers' institutes (*Ann. Rpt. Missouri State Bd. Agr., 36 (1903), pp. 260–307, pls. 5, figs. 9*).—Abstracts of some of the lectures delivered before the meetings held in 1903.

Annual report of the Illinois Farmers' Institute, with reports of county farmers' institutes, 1903 (*Ann. Rpt. Illinois Farmers' Inst., 1903, pp. 366, pls. 24, maps 2*).

Twentieth annual report of the department of land records and agriculture, Bombay Presidency, for the year 1902–3 (*Dept. Land Records and Agr., Bombay Presidency, Rpt. 1902–3, pp. 23+LVI*).—In addition to administrative reports, this document contains data relating to rainfall, agricultural implements, water supply, and irrigation.

Utilization of waste products, J. L. WELLINGTON (*Amer. Inventor, 12 (1904), No. 9, p. 200*).—The utilization of slag, gas of blast furnaces, lumber and timber wastes, slaughterhouse and packinghouse wastes (blood, hoofs, bones, horns, meat scraps, etc.), rags, and wool grease ("suint") is discussed.

On the utilization of kitchen refuse in German cities, N. LANDBERG (*Landtmannen, 14 (1903), No. 36, pp. 561–566*).

NOTES.

Alabama College and Station.—I. S. McAdory, a graduate of the Alabama Polytechnic Institute, has been appointed assistant in veterinary science, vice W. L. Thornton, resigned to engage in stock raising in Alabama. T. B. Rivett, a graduate of the Ontario Agricultural College, Guelph, has been appointed assistant in horticulture at the station, vice H. O. Sargent, who resigned to engage in teaching agriculture in the Agricultural School of the First Congressional district, Jackson, Ala.

Alabama Agricultural and Mechanical College for Negroes.—G. H. C. Williams, a graduate of the Pennsylvania State College, has been appointed instructor in agriculture.

Arizona Station.—Henry B. Slade, formerly assistant chemist of the Nebraska Station and chemist of the Idaho Station, succeeds W. W. Skinner as associate chemist. Mr. Slade is expected to prosecute research work in connection with the date palm and other organic materials. A. J. McClatchie has retired from the position of agriculturist and horticulturist of the station to his old home in California. In addition to conducting his private business, he will undertake special investigations for the Bureau of Forestry of this Department.

Arkansas Station.—A department for dairying and animal husbandry has been added, with Prof. V. A. Hooper, of Toronto, Canada, in charge. The station, in connection with the State, has purchased five head of Brown Swiss cattle at Syracuse, N. Y., for this work, with equipments for cheese and butter making.

Connecticut State Station.—Walter Mulford, station forester, has been given a year's leave of absence for study abroad, and Austin F. Hawes has been appointed assistant forester, to serve during his absence. A. W. Ogden, for fourteen years chemist at the station, has resigned to accept a position in the Bureau of Chemistry of this Department, and will be located in New York City. I. A. Andrew has been appointed chemist in the station.

Connecticut College and Storrs Station.—F. H. Stoneburn, poultryman, has resigned to become director of the Columbia School of Poultry Culture at Waterville, N. Y. He entered upon his duties September 1.

Florida University and Station.—The station staff has been reorganized as follows: Andrew Sledd, president of the university and director of the station; Chas. M. Connor, vice-director and agriculturist; E. H. Sellards, formerly of Rutgers College, entomologist and geologist; F. M. Rolfs, formerly of the Colorado Station, horticulturist and botanist; Edward R. Flint, chemist. The station is planning to undertake quite extensive cooperative experiments with potato growers in the potato-growing district, in order to get conditions as nearly normal as possible. The statement in the last number of the Record that R. A. Lichtenthaeler had resigned, was an error; he retains his position as assistant chemist.

Illinois University and Station.—H. W. Mumford has begun a series of articles on the study of animal husbandry in the *School News and Practical Educator*. The series begins with the September number, and is intended for use later in the series of leaflets on elementary agriculture as supplementary reading in rural schools.

Iowa Station.—Louis G. Michael has been appointed agricultural chemist. C. E. Ellis has been appointed assistant agricultural chemist vice E. C. Myers.

Kansas College and Station.—R. J. Brock has resigned his membership on the board of regents and has been succeeded by Geo. S. Murphey, Manhattan, Kans. Dr. N. S. Mayo has resigned his position as professor of veterinary science in the college and veterinarian of the station to accept the position of vice-director of the Central Experiment Station of Cuba and chief of the division of animal industry. Dr. Mayo first went to the Kansas institution in 1890 and has been connected with it ever since, excepting four years—from 1897 to 1901—when he held a similar position in the Connecticut Agricultural College and Station. Michael F. Ahearn, a graduate of the Massachusetts Agricultural College of the class of 1904, has been appointed foreman of the greenhouses. Geo. F. Freeman, a graduate of the Alabama Polytechnic Institute in 1903, but recently instructor in botany in the Massachusetts Agricultural College, has been appointed assistant in botany in the college and station. The college is installing a system of waterworks of its own, including the necessary piping, pumping machinery, and an elevated tank with a capacity of 100,000 gal. The auditorium, with a seating capacity of 2,700, is nearing completion. An addition to the woodworking shops is in progress of construction and will add materially to the room for machinery and for classes in mechanical drawing.

Maine Station.—In cooperation with the Bureau of Animal Industry of this Department, the station has begun the erection of a poultry house 120 by 16 ft. This is to be an open curtain-front house of about the same capacity as the other two houses at the station. In addition to the enlargement of the breeding work for egg production that will be afforded by the new house, experiments to extend over a series of years upon the relation between floor space and egg production are to be undertaken.

Maryland College and Station.—The position of horticulturist of the college and station has been filled by the appointment of Wm. N. Hutt, recently of the Utah Station. He entered upon his duties about November 1. The title of the position of agriculturist has been changed to agronomist. E. P. Walls, a graduate of the Maryland Agricultural College, class of 1903, has been appointed assistant agronomist. He is attached to the station, and will devote all of his time to the investigations of his department.

Massachusetts Station.—George W. Patch has been appointed meteorological observer, vice F. F. Henshaw. Richard H. Robertson, assistant chemist, died September 9.

Michigan College and Station.—R. H. Pettit, entomologist, has also assumed the duties of botanist of the station, the move being in the direction to separate more fully the station work from that of the college. F. O. Foster, recently at the Oklahoma College and Station, and lately engaged in commercial dairying in Baltimore, has been appointed instructor in dairying, vice John Michels, who has gone to Wisconsin University to take a post-graduate course, giving special attention to dairy cattle.

Montana College and Station.—James Reid, president of the college, has resigned. He has been succeeded by Prof. James M. Hamilton, who comes to the college from the State University at Missoula, where he was vice-president and professor of psychology and history. James Dryden, formerly meteorologist and poultryman at the Utah Station, has accepted a position as clerk and poultryman at the station.

New York State Station.—N. O. Booth, recently horticulturist in the Washington College and Station, has returned to the above station as assistant horticulturist, vice V. A. Clark, who, as previously noted, has gone to the Arizona Station.

Pennsylvania College and Station.—The Bureau of Animal Industry of this Department has assigned $1,000 of the recent Congressional appropriation for investigations in the breeding and feeding of domestic animals, to the cooperative investigations with the respiration calorimeter, now in progress at the station. Plans have been made for an investigation upon the influence of age and individuality upon the metabolism of cattle, and two yearling steers, one a Polled Angus and one a Jersey,

have been purchased for use in the investigation, which is expected to extend over several years. J. A. Fries, first assistant in animal nutrition, has been given a year's leave of absence for study abroad. The position will be filled during his absence by W. W. Braman, formerly second assistant in animal nutrition, and R. E. Stallings, assistant chemist, will serve as second assistant in animal nutrition. The fellowships in agricultural chemistry and dairy husbandry have been discontinued.

South Carolina College and Station.—Dr. Louis A. Klein has been elected to succeed Dr. G. E. Nesom as chief of the veterinary division. F. C. Atkinson has been appointed assistant chemist.

Tennessee University and Station.—Dr. Brown Ayres, formerly dean and professor of physics at Tulane University, New Orleans, has succeeded Dr. Charles W. Dabney as president of the university. Samuel M. Bain, botanist of the university and station, has undertaken work in cooperation with the Bureau of Plant Industry of this Department in the breeding of varieties of cotton resistant to attacks of the boll-weevil. During Professor Bain's necessary absence in carrying on this work Samuel H. Essary has been appointed assistant botanist of the station and instructor in botany in the university. Henry H. Hampton, assistant chemist of the station, has been succeeded by Walter H. Brown.

Virginia Station.—The station staff was reorganized the past summer, as follows: Andrew M. Soule has been appointed director; Harvey L. Price, horticulturist; William D. Saunders, dairy husbandman; Meade Ferguson, bacteriologist; John G. Ferneyhough, veterinarian; John R. Fain, agronomist; William A. P. Moncure, assistant mycologist; Phares O. Vanatter, field experiments; Walter Ellett, assistant chemist; Arthur P. Spencer, assistant in animal husbandry; Ellison A. Smyth, consulting biologist; David O. Nourse, consulting agrononomist; Thomas L. Watson, consulting geologist; Clement E. Craig, foreman of the field experiments. The work of the station will be specialized much more in the future than in the past and the working force more than doubled. An extensive system of field investigations will be undertaken. The department of field experiments will conduct the field work proper. The chemical and soil work will be undertaken by the department of chemistry. A forty-acre field has been laid out for this work, and extensive plantings made this fall. Special attention will be given to the department of animal husbandry, and the plans are now on foot to organize extensive feeding experiments with beef and dairy cattle, and swine. The college maintains about 300 head of live stock, a large percentage of which are pure-bred animals, there being choice representatives of three of the principal beef and dairy breeds. The dairy department will also undertake some special lines of investigation on pasteurized milk at an early date, while studies on soil bacteria will be undertaken by the bacteriologist. The work on cider making and the chemistry of fruits will be continued.

Wyoming Station.—F. E. Hepner, of South Dakota, has been appointed research chemist of the station. He began work October 1. The plans of work for the year in chemistry include water and forage plant analyses and digestion experiments with high-altitude stock foods. E. E. Nelson, assistant in horticulture and agrostology, resigned his position, to take effect October 1. B. P. Fleming, irrigation engineer of the station, has resigned his position in order to continue his studies at Cornell University.

United States Department of Agriculture.—Dr. R. E. B. McKenney, assistant physiologist in the Bureau of Plant Industry, who has been making a special study of the mosaic disease of tobacco, has resigned to accept a position with a firm doing business at Panama.

Dr. Ernst A. Bessey, who has been abroad for over two years, returned in October. While abroad he traveled in Russia, the Caucasus, Turkestan, and Algeria for this Department. He spent some time in study in the Universities of Halle and Munich, finishing his work for the doctorate in Halle last spring. He has been appointed in

the Office of Vegetable Pathological and Physiological Investigation, of the Bureau of Plant Industry, to make a thorough study of diseases of crops caused by nematodes.

Thomas H. Kearney, of the Bureau of Plant Industry, has gone to North Africa and other Mediterranean coast regions for the purpose of securing new seeds and plants adapted to the southwest. He will make a special study of the date palm and plan for new introductions of this fruit. Alkali-resistant forage crops will also be studied, and seeds of new and promising kinds will be collected for testing in this country.

W. P. Corsa, assistant pomologist in the Division of Pomology for the past 14 years, died September 3.

At the International Engineering Congress at St. Louis October 3 to 8, Elwood Mead, of this Office, was selected to present one of the four papers on irrigation, the other three papers being presented by foreign representatives. The subject of Mr. Mead's paper was Irrigation in the United States, and dealt with the development and present scope of irrigation, the engineering aspects, cheapening of construction, the reform of State laws, National legislation, and National and State investigation relating to irrigation.

County Experiment Stations.—In the September issue of the *Iowa Agriculturist* an account is given of the movement in that State toward the establishment of county experiment stations at the county poor farms. The purpose of these experiment stations is to answer some of the local county problems. The work undertaken at the station first established was to grow side by side 30 varieties of corn obtained from farmers in different parts of the county. The yields of these varieties varied from 15 to 55 bu. of grain per acre, thus bringing the fact home to farmers that there is a great difference in the value of the seed corn grown by different farmers in the same locality. This result opens up a vast number of similar problems with other crops. The first of these stations was established in Sioux County two years ago, the board of supervisors granting the money necessary to carry on the experiments. Since then Story, Marshall, Adams, and Pocahontas counties have established similar stations. The writer points out that there are five or six distinct soil types in Iowa, and that therefore tests of varieties of roots, grains, and grasses at the station on one type of soils may not be applicable in many other portions of the State. This is where the county experiment stations will come in investigating these local problems.

Wallace's Farmer, discussing the same subject, states that "the agricultural college cooperates with these various counties to the extent of sending a man to the farm to direct the method of preparation, to lay out the ground, and to teach the man in charge how to keep the correct data and thus furnish exact information that will be of value . . . Incidentally, the poor farm in counties where this method has been adopted becomes a center of great public interest. It is a favorite place for picnics during the growing season, where the farmers can see for themselves just how these experiments are coming on."

School of Forestry in Wales.—A conference of delegates appointed by the Welsh county councils to discuss the question of afforestation in the principality was held at Swansea on September 7. According to a brief account of this in *Nature*, Sir Charles Philipps, who presided, remarked that there was in Wales an enormous area which could be profitably afforested. It was necessary that professors of the subject should be appointed at the universities and that practical demonstration areas should be set apart. The view was expressed, in course of discussion, that the establishment of a central school of forestry for Wales was of the utmost importance, and that such a school would become self-supporting after a few years. It was at length resolved that the members should urge on their respective councils the great importance of the study and practical application of forestry by providing lectures to be given at suitable centers and bursaries, enabling students to attend these lectures; also that a central school of forestry be established with example plants of

three or more acres and demonstration areas of suitable extent, and that the necessary expense be defrayed by the county councils on the basis of their respective ratable values, the whole amount now asked for not to exceed £5,000.

Agriculture in Union Academy.—A four-year agricultural course is now offered by Union Academy, Belleville, N. Y. This is done at the request of George and Wm. W. Mather, who, in 1901, gave Union Academy $10,000 for the support of a school of agriculture. The course in agriculture includes two terms each of instruction in drafting plans for farm buildings, entomology, soils and fertilizers, horticulture, plant life, economics of agriculture, animal husbandry, poultry keeping and zootechny, and one year of agriculture (agronomy). Lyman Carrier, who had charge of chemistry and agriculture in the Elyria, Ohio, High School last year, has been elected vice-principal of Union Academy, and will teach science and agriculture.

New Journal of Agricultural Science.—The prospectus has been issued of a *Journal of Agricultural Science*, the publication of which is to be commenced at Cambridge, England, with the beginning of the year. The new journal will be edited by Messrs. T. H. Middleton, T. B. Wood, R. H. Biffin, and A. D. Hall, in consultation with W. Bateson, J. R. Campbell, and W. Somerville. The cooperation of a long list of gentlemen engaged in work in agricultural science has been promised.

The prospectus points out that there are now about 25 agricultural colleges in England, the larger number of which have been established during the past decade. Many of these institutions are equipped with permanent laboratories and experimental farms, and are beginning to devote their attention to definite scientific work in chemistry, botany, and other sciences bearing on agriculture. At present there appears to be no way of getting the results of their scientific work before the proper audience. It is the purpose of the new journal to publish only distinctly scientific work in agricultural science, and it will not include the results of the ordinary trials of manures and varieties for demonstration or commercial purposes.

New Veterinary Journal.—The first number of a new veterinary journal, entitled *Western Veterinarian*, was issued in July. This journal is to be published quarterly as the official organ of the California State Veterinary Medical Association, as a continuation of the quarterly bulletin of that association. The purpose of the change of name and appearance is to admit of an enlargement of the scope of the journal. The *Western Veterinarian* will contain a record of the proceedings of the California Veterinary Medical Association, news items, and original articles relating to veterinary science and practice.

Miscellaneous.—The Higher Education Subcommittee of the Lancashire Education Committee has issued a series of circulars describing the provisions made in the county for instruction in agriculture. Full particulars are given of courses in agriculture to be carried out at the County Council Farm at Hutton and the Harris Institute at Preston, as well as in other parts of the county. At the Harris Institute the course extends over four years, and is intended to prepare young men for the practical work of farm life. The subcommittee has also made arrangements to consider applications from local committees, agricultural societies, and farmers' associations for courses of lectures by members of the staff of the Harris Institute.

We learn from *Nature* that the Indian Tea Association is contemplating the establishment of an experiment station in Assam. The scientific advisor of the association has explained his plan for the permanent location of his assistant in Assam, the provision of a laboratory for him, and the initiation of experiments in tea culture under his direct supervision and control. An offer has been made by the agents of the Scottish Assam Tea Company to provide a small bungalow and tea for experiment in the immediate neighborhood of the bungalow, and further land for experiments as required. This offer was accepted, and arrangements have been made for the erection of a laboratory.

J. D. Towar, formerly of the Michigan College and Station, has returned from South Australia, where since 1902 he has occupied the position of principal of the Roseworthy Agricultural College and professor of agriculture in that institution.

Dr. Robert Ostertag, a member of the faculty of the veterinary high school at Berlin, and the foremost authority on meat inspection in Germany, recently made a tour of this country for the purpose of becoming more thoroughly acquainted with the conditions which prevail here with regard to veterinary medicine and animal industry. Doctor Ostertag visited many of the larger abattoirs in our chief cities, inspected a number of our veterinary schools, stock farms, and dairy institutions. A very favorable impression was formed by Doctor Ostertag regarding the work of the Bureau of Animal Industry in eradicating sheep scab and dipping cattle for the destruction of ticks. Many of our veterinary schools were considered by him as still defective in their curricula, but two especially (Cornell and Pennsylvania) were referred to as furnishing high grade and satisfactory instruction in all respects. Doctor Ostertag considered that some of our dairy farms were equal or superior with respect to general management, sanitary conditions, etc., to any similar institutions in the world. The system of meat inspection instituted and maintained by the Bureau of Animal Industry was considered as exceedingly effective and satisfactory. While at Ames, Iowa, Doctor Ostertag investigated the course in animal husbandry offered at that institution, and was so well impressed with its efficiency that he has decided to establish a course as nearly like it as possible in the veterinary high school at Berlin.

The Very Rev. Samuel Reynolds Hole, Dean of Rochester, England, and widely known as a writer on roses, died at his home on August 24, in his 85th year. He was one of the originators of the National Rose Society of England, and has been its president since the establishment of that society in 1858. He is best known perhaps to horticulturists through his Book About Roses, How to Grow and Show Them, and his book published in 1899, entitled Our Gardens. The Book About Roses has gone through 19 editions.

B. M. Everhart, well known for his work in systematic mycology, died at his home in Westchester, Pa., September 22, 1904, in his 87th year.

Dr. F. Nobbe, since 1868 professor in the Forestry School and director of the Experiment Station for Plant Physiology in Tharand, retired from active duties with the beginning of October.

Earnest Shearer has been appointed lecturer on agriculture at the Pusa Imperial College, Bengal, India. References have previously been made to the establishment of this model agricultural college for India, with a farm of 1,300 acres.

We learn from *Science* that Alexander Lauder, senior demonstrator in chemistry in the University College of North Wales, Bangor, has been appointed lecturer in agricultural chemistry in the Edinburgh and East Scotland College of Agriculture.

A chair of agricultural mechanics has been established at the University of Göttingen, and Dr. Ludwig Prandtl has been appointed to the chair.

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EXPERIMENT STATION RECORD.

VOL. XVI. NOVEMBER, 1904. No. 3.

The practical demonstration of the methods employed in certain lines of agricultural instruction and investigation, as carried out at the St. Louis Exposition, was a novel undertaking. It supplemented very effectually the combined exhibit of the American agricultural colleges and experiment stations in the Palace of Education, and illustrated the methods which have been worked out for important branches of work and which could not well be shown in the other exhibit. As these methods have been largely developed in this country and are essentially American in their details, a demonstration of them was desirable to a clear understanding of the American system of agricultural education and research. The fact that exercises in stock judging, grain judging, and the like were being carried on by classes of students from the agricultural colleges, under the direction of instructors in these subjects, added materially to the interest of the exhibit, and served to demonstrate the practical character of the methods.

Two sessions of this "School of Breeding, Feeding and Judging Live Stock, and of Breeding Field Crops" were held, each of two weeks' duration. The first session was from September 12 to 24, during the cattle show, and the second from October 3 to 15, during the show of sheep and swine. The sessions were held in the Live Stock Congress Hall. An arena 45 by 75 feet was arranged in elliptical form, surrounded by terraced seats sufficient to accommodate 1,100 people. The tardiness of the exposition management in making provision for this exhibit made it possible to hold only two periods instead of three as contemplated, and greatly interfered with the progress of the exercises during the first session. A pavilion was originally planned for these exercises, but this was abandoned by the exposition management, and quarters assigned in the Live Stock Congress Hall. A $2,300 refrigerating plant was installed in a room adjoining the arena, and this was stocked with meat for the judging work. A five-horsepower motor was also furnished for thrashing the crops of the breeding plats. The school was under the general charge of Prof. J. H. Shepperd, of North Dakota.

The plan followed was to have about twenty-five students from five different agricultural colleges present at each session, to act as classes

for the instructors to use in demonstrating their methods of teaching live-stock judging, dressing and curing meats, judging grain, making gluten, sponge and baking trials with flour, and in thrashing, grading, and milling wheat. Animals were slaughtered in the presence of students and demonstrations given of the cutting and curing of meats. Exercises in judging corn and small grains, and in placing rings of all of the market and breeding classes of cattle, sheep and swine, constituted the programme rendered from day to day.

Sessions of the school were held daily in the forenoon, afternoon, and evening. Moving pictures representing the active work of students in judging live stock, studying farm mechanics, judging corn, carrying out the exercises in agricultural engineering, and the work of plant and animal breeding, were thrown upon the screen at intervals during the day. Addresses upon various phases of plant and animal breeding, feeding, methods of instruction, and kindred subjects were also delivered throughout the four weeks of the school. Approximately fifty lectures were given during the two periods, and a total of fifty students from various institutions took part in the work of the school from time to time.

The exercises in judging live stock and grains and the demonstration of the methods employed in instruction proved to be of much interest and attracted good-sized crowds. The slaughtering and cooking trials especially attracted the attention of the stock breeders and exhibitors present, who followed the trials closely and seemed to take a deep interest in them. It was frequently pointed out by visitors that the experiment stations are singularly well fitted to conduct slaughter trials, in which animals which have ranked well on foot are submitted without favor or prejudice to the crucial on the block, since private exhibitors often hesitate to take the risk.

The demonstration of the methods employed in plant-breeding work at the experiment stations was quite complete. Matured plants of oats, wheat, barley, spelt, millet, and flax, and young corn plants were set in natural form as they appear in the plant nurseries in actual work, with about two-thirds the usual interspaces. They were shown in all stages, some with clipped borders, others partially culled out in selecting the better plants, and others with the final or choice plants only remaining, which were to be kept for seed. On other plats the plants were harvested and placed in their proper receptacles.

Specimen record books were displayed and forms of plant pedigrees as they are ordinarily kept were shown. All forms of plant records and labels used in experimental work were shown in position as they are used in this work, so that visitors were able to see the entire system which has been worked out for plant breeding. A thrashing machine for plant-breeding work, a fanning mill, electric bake oven, and a small patent roller test mill (used for determining the grade of flour which a

sample of wheat will produce) were also exhibited in active operation, and the chemical apparatus employed for fat extraction and the determination of nitrogen in corn-breeding work was also shown.

The plant-breeding work, as it turned out, furnished good material for display and enabled an interesting and attractive exhibit to be made. It was so arranged as to enable the crowd to obtain a good general idea of the methods in a few minutes, while those who chose to spend a longer time in making a more complete study of the exhibit were afforded opportunity to do so.

The attendance at the various exercises of this "school" ranged from 50 to 1,000 people at a session, varying with the attendance at the fair and with the condition of the weather. The practical exercises and demonstrations proved as a rule to be of greater interest than the more formal lectures and moving-picture displays. The inaccessibility of the place where the school was held undoubtedly affected the attendence.

The indications are that the school made a marked impression upon a considerable body of people, who gained through it a much clearer conception of the methods employed at the agricultural colleges and experiment stations than they had previously had or than could well have been given in any other way.

The comments upon the exhibit of the agricultural colleges and experiment stations as a whole have been most favorable and complimentary.

It was in no sense a "show" exhibit, but the materials comprising it were those in actual use for instruction and experimentation at our land-grant colleges and experiment stations, or those representing with as much realism as possible the practical results of research. It was undoubtedly the most successful exhibit which these institutions have yet made, and its location in the Palace of Education secured for the agricultural departments of the colleges and the experiment stations a recognition of their place among the great educational efforts of the nation. It impressed itself upon intelligent observers as a worthy and consistent exposition of certain features of education and research in the relations of science to agriculture and the mechanic arts.

Its success was attested by the comments of competent judges and real seekers after information, as well as by the awards granted by the several juries. Exclusive of those granted to collaborators, there were one hundred and thirty-five awards made to the exhibit, including twenty-four grand prizes, forty-one gold, thirty-five silver, and thirty-five bronze medals.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The action of water and saline solutions upon certain slightly soluble phosphates. F. K. CAMERON and L. A. HURST (*Jour. Amer. Chem. Soc., 26 (1904), No. 8, pp. 885–913*).—The methods used and the results obtained in a study of the action of varying proportions of water and of sodium nitrate and potassium chlorid and sulphate on phosphates of iron and aluminum, and of water, calcium chlorid and nitrate, and potassium chlorid and sodium nitrate on tricalcium phosphate are given.

The method used was as follows: "In the majority of cases the procedure employed was to weigh the solid phosphate into a bottle and then add 200 cc. of water or solution. . . . Eight-ounce sterilizer bottles, tightly closed with rubber stoppers, were found to be very convenient. The bottles were completely immersed in a constant temperature-bath which varied less than 1° C. during the experiment. In some cases the bottles were occasionally shaken by hand, but in others they were placed in a submerged rotating cradle, driven by an electric motor, and the contents thus kept constantly agitated. When the solutions had remained in the constant-temperature bath the desired length of time, the bottles were placed in an upright position for 24 hours, or longer, to permit the suspended solid particles to subside, as far as possible, and then the supernatant solutions were passed through filters. An aliquot part of the clear filtrate, usually 100 cc., was then titrated with a standard solution of potassium hydroxid free from carbonates, using phenolphthalein as indicator, to determine the 'acidity' of the solution. . . . The phosphoric acid was then precipitated, in the usual way, as phosphomolybdate, and estimated gravimetrically as magnesium pyrophosphate, or occasionally by titrating the yellow phosphomolybdate precipitate with a standard solution of alkali. In a few cases the dissolved phosphoric acid was present in such small quantities that it was found desirable to estimate it by a colorimetric method."

The results are summarized as follows: "It appears that the rate of action of water upon phosphates of iron and aluminum, or upon tricalcium phosphate is very slow, so that neither in this investigation nor probably in any yet recorded, have final equilibrium conditions been observed. Free acid accumulates in the solution and a portion of the corresponding base is precipitated. While the free phosphoric acid tends to increase the solubility of the phosphate, the base, even though in solution in correspondingly smaller amounts, exerts a greater effect in decreasing it. Therefore, the addition of increasing amounts of water produces a relatively smaller (though in actual amounts a larger) solution and decomposition of the phosphate. . . .

"The presence of potassium chlorid in the solution decreases the amount of phosphoric acid obtained from iron, aluminum, or calcium phosphate. It increases the amount of iron, aluminum, or calcium entering the solution. . . .

"Potassium sulphate, as previously observed by Lachowicz, increases the amount

of phosphoric acid entering the solution from iron phosphate, but decreases the amount entering the solution from aluminum phosphate.

"Sodium nitrate decreases the amount of phosphoric acid entering the solution from either iron or aluminum phosphate, but appears to slightly increase the amount yielded by calcium phosphate, while it greatly increases the amount of calcium yielded to the solution by the last-named substance. . . .

"With pure water in contact with the phosphates the acidity of the resulting solutions appears to be in the same direction as the concentration with respect to phosphoric acid, but no satisfactory correlation has been made between the two sets of determinations. In solutions of more soluble salts in contact with the phosphates, no generalization whatever seems justified. Potassium chlorid, potassium sulphate, and sodium nitrate all increase the acidity of solutions in contact with iron phosphate, while potassium chlorid and sodium nitrate decrease the amount of the phosphoric acid in the solution. No correlation of the acidity with the amounts of iron in the solution seems possible, although, as is shown by the solutions of potassium chlorid, the base in solution is increased.

"In contact with calcium phosphate, potassium chlorid, and sodium nitrate decreased the acidity of the solution instead of increasing it, as in the case of iron phosphate. In both cases, however, the amounts of calcium in the solutions decidedly increased, and in the case of sodium nitrate the phosphoric acid also.

"In so far as observations were made, an increase of temperature increased the decomposition of the solid phosphates in either water or salt solutions.

"Owing to the complexity of the reactions involved between the hydrolyzed products and the other solutes, and perhaps also to the fact that definite equilibrium conditions were not under observation, attempts to apply the mass law to the results have not been satisfactory. The hypothesis of electrolytic dissociation has, in many of the cases observed, failed to give a satisfactory explanation."

A new method of rendering soluble the phosphoric acid in crude phosphates, A. Ystgaard (*Teknisk Ugeblad, Christiania, 50 (1903), No. 34, pp. 329–332*).—Experiments were conducted by the author (see also E. S. R., 15, p. 1063) for the purpose of rendering soluble the phosphoric acid of crude phosphates (apatite) at a comparatively low temperature and without the aid of silica. The effort was made to replace the lime in the phosphate with magnesia in the form of carnallite (or carnallite and kieserite), by which method 80 to 90 per cent of the total phosphoric acid was rendered soluble in a 2 per cent citric-acid solution.

By using bone ash as phosphatic material, in the place of apatite, as in the earlier experiments, 96 to 98 per cent of the total phosphoric acid was rendered soluble in citric-acid solution.

In experiments on a larger scale, apatite, carnallite, and kieserite, in the proportions of 1:2:1 were found to furnish a product that melted at about 650° C. and hardened on cooling to a brittle mass that may be easily reduced to a fine powder. The composition of this fertilizer was found to be as follows: Total phosphoric acid, 20.71 per cent; citric-acid-soluble phosphoric acid, 15.23 per cent; chlorin, 16.47 per cent; lime, 9.92 per cent; magnesia, 10.20 per cent; potash, 6.85 per cent.

Comparative fertilizer trials with this fertilizer and basic phosphate for oats and peas showed the former to possess a considerably higher value than the latter. The yields obtained with the new phosphate were 123 of oats and 140 of peas, those obtained with basic phosphate being placed at 100.—F. W. WOLL.

Contribution to the knowledge of the action of sterile and fermenting organic matter on the solubility of the phosphoric acid of tricalcium phosphate, A. Stalström (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), p. 724; abs. in Chem. Ztg., 28 (1904), No. 45, Repert. No. 13, p. 158*).—Experiments are reported which show that organic substances, such as humus, sour milk, etc., when not sterilized, dissolve tricalcium phosphate.

Determination of phosphates in natural waters, A. T. LINCOLN and P. BARKER (*Jour. Amer. Chem. Soc., 26 (1904), No. 8, pp. 975–980*).—Satisfactory tests on water of a modification of Schreiner's method (E. S. R., 15, p. 444) in which a sufficient amount of phosphate solution of known strength is added to make the proportion of phosphoric acid approximately equal to that of silica are reported.

Are inorganic phosphates found in seeds and seedlings? E. SCHULZE and N. CASTORO (*Ztschr. Physiol. Chem., 41 (1904), No. 5, pp. 477–484*).—From studies of a number of sorts of seeds the conclusion was reached that the phosphorus compounds designed as a reserve material occur entirely or almost entirely in organic forms.

If the seedlings grow for a considerable time without light it appears that a part of the organic phosphorus is changed into inorganic forms. This change probably takes place to a very limited extent in the case of germination under normal conditions. In such cases lecithin should be mentioned as one of the compounds formed from phosphorus reserve materials. The phosphoric acid occurs in the same part of the seeds as the reserve protein, fat, and carbohydrates, and the fact that it increases or decreases with the reserve protein is regarded as more than accidental.

Potassium tetroxalate as a titrating reagent, O. KÜHLING (*Chem. Ztg., 28 (1904), Nos. 50, p. 596; 51, p. 612*).—A reply to G. Lunge's criticism of the author's method of preparing this substance (E. S. R., 15, p. 649).

The use of potassium tetroxalate as a titrating reagent, G. LUNGE (*Chem. Ztg., 28 (1904), No. 60, pp. 701, 702*).—A reply to criticisms by Kühling (noted above).

Potassium tetroxalate as a titrating reagent, O. KÜHLING (*Chem. Ztg., 28 (1904), No. 64, p. 752*).—A reply to Lunge's article noted above.

Dumas' method of determining nitrogen, A. LANDSIEDL (*Chem. Ztg., 28 (1904), pp. 643, 644; abs. in Chem. Centbl., 1904, II, No. 4, pp. 363, 364, fig. 1*).—An improved measuring tube for use in this method is described.

The volumetric determination of nitric nitrogen by means of ferrous sulphate, G. BAILHACHE (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 14, pp. 843–846*).—The author describes his modification of the Pelouze method substituting ferrous sulphate for ferrous chlorid, operating in an atmosphere of carbon dioxid and titrating the unoxidized ferrous salt with potassium permanganate or bichromate. The author objects to Debourdeaux's modification of his method using a carbon dioxid apparatus and a refrigerator (E. S. R., 15, p. 747) as difficult of operation.

The estimation of ammonia in animal juices and organs, M. NENCKI and J. ZALESSKY (*Arch. Sci. Biol. [St. Petersburg], 9 (1901), pp. 322–336; Chem. Centbl., 1903, I, pp. 601, 602; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 554*).—A modification of the usual method is described.

The form in which nitrogen occurs in the proteid molecule, T. GÜMBEL (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 5–6, pp. 297–312*).—A critical study of W. Hausmann's[a] method of determining the amount of different kinds of nitrogen in protein is reported. This method depends on the cleavage of the protein with boiling concentrated hydrochloric acid; the estimation of the amid nitrogen by distillation with magnesia; the separation of the diamin or basic nitrogen by precipitation with phosphotungstic acid, and the estimation of the monamino nitrogen not separated by the magnesia and phosphotungstic acid.

The conclusion was reached that in the case of the amid nitrogen the results are very accurate, and that they are quite accurate in the case of the monamino nitrogen, while in the case of the diamino nitrogen they are accurate within 0.8 of a per cent, the values being generally too low.

Concerning the form in which nitrogen occurs in albumin, C. ROTHERA (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 9, pp. 442–448*).—Continuing work referred to above, Hausmann's method was further studied. The conclusion was

[a] Ztschr. Physiol. Chem., 27, p. 91; 29, p. 136.

reached that the amid nitrogen was derived from two portions of the proteid molecule and that the estimation of the quantities from the different sources would be of value. The author concluded further that melanin, at least the major portion, was not formed at the expense of the easily cleaved nitrogen (amid nitrogen). The distribution of nitrogen in ichthin and chitin was also studied.

Concerning the estimation of albumen and some other nitrogenous constituents of plants, N. Nedokutschajew (*Landw. Vers. Stat., 58 (1903), Nos. 3-4, pp. 275-280*).—The analytical data reported led the author to conclude that the unripe and ripe wheat grain contained proteids soluble in water, which are thoroughly coagulated only when warmed under a pressure of 1.5 atmospheres. When this was done no cleavage was noted which could affect analytical results.

In addition to the true proteids the wheat contained albumoses precipitated from a solution by saturation with zinc sulphate. Estimating proteids by heating to 112° C. and precipitating albumoses with zinc sulphate gives somewhat higher results than the Stutzer method. The grain in all stages of growth also contains an appreciable quantity of nitrogen in compounds which are precipitated with phosphotungstic acid. A small amount of xanthin bases is also precipitated.

The results of both quantitative and qualitative analyses warrant the conclusion, in the author's opinion, that the unripe grain contains a complicated mixture of crystallizable nutritious bodies. The diminution of these bodies as the grain ripens indicates that they play an important rôle in the formation of reserve proteids.

Volumetric determination of humus in soils by means of potassium permanganate, Ishcherekov (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, pp. 55-67*).—The author criticises the methods at present in use as either too complicated or inaccurate. The method proposed by him is as follows:

After the soil is well pulverized in an agate mortar a sample weighing 0.5 to 0.1 gm., according to the richness of the soil in humus, is placed in a flask of 250 to 300 cc. capacity; into the flask a standard solution of potassium permanganate ($\frac{1}{10}$ or $\frac{1}{5}$ normal) is next introduced in considerable excess, from 2 to $2\frac{1}{2}$ times as much as is necessary for the complete oxidation of the humus content (0.01 gm. of humus requires 9.72 cm. of $\frac{1}{5}$ normal potassium permanganate solution). Then 2 to 4 cc. of sulphuric acid are added, i. e., somewhat more than is necessary for the reaction. An amount of water equal to that of the potassium permanganate solution is also added to replace the water evaporated in the subsequent boiling. The flask is heated in an inclined position, bringing the contents to gentle boiling, which is maintained for 40 to 50 minutes. Then titrate with oxalic acid.

On the addition of the latter the characteristic color of the permanganate solution disappears first and then the brown oxid of manganese, but the black manganese peroxid sometimes dissolves with great difficulty. In that case an excess of oxalic acid is added, the liquid again brought to boiling, and the solution titrated back with potassium permanganate.

Assuming that all the oxygen given off by the potassium permanganate is used up for the oxidation of the humus it is easy to calculate the amount of carbon dioxid formed, from that the carbon of the humus, and then the humus itself.

The method was tested with satisfactory results (which are reported) on a variety of soils. The author in a number of cases collected the carbon dioxid formed in the oxidation by potassium permanganate and calculated therefrom the humus and obtained values which did not differ much from those given in the analyses.—P. FIREMAN.

Determination of humus by the chromic method, A. N. Sabanin (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 5, pp. 573-594*).—The author gives the results of parallel determinations of humus in 126 soils by the chromic method as carried out in the agricultural laboratory of the Moscow University, and by the

method of Gustavson. The author having adopted a number of modifications introduced by various chemists, carries out the chromic method as follows: 2.5 to 5 or more grams of the soil are treated with a 5 to 10 per cent solution of phosphoric acid, dried at 103 to 105° C., and then transferred to a flask of 250 cc. capacity by the aid of a mixture of 30 cc. of concentrated sulphuric acid and 20 cc. of water. Instead of potassium bichromate crystallized chromic acid (CrO_3) is used to the amount of 7 to 9 gm.

It is quite necessary to regulate the oxidation. In 10 seconds 18 to 20 gas bubbles should pass through the potash bulbs filled with concentrated sulphuric acid for the absorption of the water. The product of the oxidation and the water vapor pass first through a Classen cooling apparatus and then, in order to retain the vapor of hydrofluoric and hydrochloric acid, through a U containing a bright fine iron wire spiral. The carbon dioxid is absorbed in the usual way.

The results obtained by this method were somewhat lower than those obtained by Gustavson's method. This difference is due, according to the author, to the fact that there is in the soils ready-formed carbon dioxid which Gustavson does not remove by treatment with phosphoric acid before the combustion. By using chromic acid in place of potassium bichromate the author avoids some sources of error connected with the formation of chrome alum in the latter case.—P. FIREMAN.

On the question of the acetic-acid extract of soils, D. N. PRIANISHNIKOV (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5* (*1904*), *No. 2, pp. 197–200; abs. in Chem. Centbl., 1904, II, No. 6, p. 554*).—The author believes that the results obtained by extracting soils with acetic acid does not furnish a reliable means of judging of their fertilizer requirements. Account must be taken of the insolubility of the reverted phosphoric acid in the solvent. Moreover, the iron phosphate which is insoluble in acetic acid furnishes a fairly assimilable source of phosphoric acid for plants as Gedroitz has shown (E. S. R., 15, p. 549) and the author has confirmed in sand cultures with oats, millet, and lupines in 1900 and 1903.

On the reaction of lard from cottonseed meal-fed hogs, with Halphen's reagent, E. FULMER (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 7, pp. 837–851*).—The effect of cotton-seed oil upon the character of lard was studied. The minimum amount consumed during the experimental period was 1.8 lbs. per 100 lbs. of weight, and the maximum amount 75 lbs. Samples of fat were in every case taken from the kidney, jowl, back, and intestines, and in many cases from the belly also.

"All lard samples gave a distinct and, in some cases, a very strong coloration when treated with Halphen's reagent. The coloration equivalent, expressed in percentages of cotton-seed oil, ranged from 0.4 to 15 per cent. In general, the greatest degree of coloration was found in kidney fat lard, and the least in intestinal fat lard. . . .

"If the degree of coloration with Halphen's reagent is to be expressed in terms of percentage of cotton-seed oil, the kind of oil used for comparison, and the conditions under which the comparison is made should be stated, because different oils respond with unequal intensity, and the depth of color increases after cooling. When the color-producing substance is once deposited in the fat of hogs, it is exceedingly persistent. . . .

"While the evidence is somewhat conflicting we are rather unwillingly led to the conclusion that probably the color-producing principles are separated from the cotton-seed oil by metabolic processes, and that the effects of metabolism are so profound that its final products, if they find their way into the fat, do ~~not~~ modify it in any important degree."

Identification of boric acid in meat, A. REINSCH (*Ber. Untersuch., Altona, 1903, pp. 10, 11; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 9, p. 555*).

Concerning a new method of estimating sugar in chocolate, A. STEINMANN (*Ztschr. Oeffentl. Chem., 9* (*1903*), *pp. 239–249, 261–269; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 9, pp. 560–562*).

Estimating sugar in cocoa products, JESERICH (*Ztschr. Oeffentl. Chem., 9 (1903), pp. 452–454; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 562*).

Examining and judging cocoa products, FILSINGER (*Ztschr. Oeffentl. Chem., 9 (1903), p. 7; abs. in Hyg. Rundschau, 14 (1904), No. 3, pp. 146, 147*).—Analytical data are reported and discussed with special reference to the examination of chocolate and other cocoa products.

Note on the identification of Bombay mace in powdered mace, W. BUSSE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, pp. 590, 591*).—The author considers his method reliable.

Note on the examination of molasses feeds for fat and sugar, D. J. HISSINK (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 125–134*).—Different methods are compared and discussed.

The preparation of crude fiber from plant fibers containing lignin by means of sodium superoxid, A. DUSCHETSCHNIK (*Zhur. Russ. Fiz. Khim. Obshch., 35 (1903), No. 12, Protok., pp. 159, 160; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, p. 631*).—Using sodium superoxid mixed with magnesium sulphate, the author obtained very favorable results in separating crude fiber from spruce wood and from jute. The method of procedure is described.

The estimation of starch in substances containing pentosan, S. WEISER and A. ZAITSCHEK (*Landw. Vers. Stat., 58 (1903), No. 3–4, pp. 219–231*).—The experimental data which are reported led the author to conclude that in the analyses of feeding stuffs pentosans should be estimated as well as starch if accurate results are desired.

The true starch content can be calculated, he points out, if the amount of copper precipitated by the reducing bodies formed from pentosans is deducted from the amount precipitated by the total reducing bodies obtained in the usual methods of analyses. Estimating the starch and pentosan is a decided advantage, as it lessens the amount of nitrogen-free extract, and so makes for accuracy.

Methods for the quantitative chemical analysis of the brain and cord, W. KOCH (*Amer. Jour. Physiol., 11 (1904), No. 3, pp. 303–329*).—Analyses of white and gray matter of human brain with special reference to the distribution of phosphorus and nitrogen are reported, the analyses being illustrative of the analytical methods described.

Concerning the solution and swelling of colloids, K. SPIRO (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 5–6, pp. 276–296*).—Studies of gelatin by methods of physical chemistry are reported and discussed.

Fourth annual report of the agricultural chemist for the year 1902–1903, A. LEHMANN (*Dept. Agr. Mysore State, Rpt. Agr. Chem., 1902–3, pp. 27*).—This report "contains results of plat experiments, [and] gives the composition of various soils, fertilizers, coffees, oils, and water analyzed during the year. It gives also a few notes on entomology and a short report on a rice huller."

A rapid accurate method for the volumetric estimation of carbon dioxid, T. MACARA (*Analyst, 29 (1904), No. 338, pp. 152, 153, fig. 1*).—A method based upon the fact that barium carbonate behaves like an alkali toward methyl orange is described. The carbon dioxid evolved in the usual way is collected in a barium hydrate solution, the barium carbonate formed being titrated with standard acid, using methyl orange as an indicator.

The filtration and incineration of slimy precipitates, M. DITTRICH (*Ber. Deut. Chem. Gesell., 37 (1904), pp. 1840–1842; abs. in Chem. Centbl., 1904, I, No. 22, p. 1501*).—The filtration and incineration of such precipitates are facilitated by shaking them up with water and filter paper until the latter is reduced to a fine pulp.

Note on the use of hydrazin sulphate in eudiometric analysis, J. DE GIRARD and A. DE SAPORTA (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 15, pp. 905–907*).

Chemical technology and analysis of oils, fats, and waxes, J. LEWKOWITSCH (*London: Macmillan & Co., Ltd., 1904, 3. ed. enl., vols. 1, pp. 427, figs. 53; 2, pp. 709, figs. 35*).

On the new sedimentation apparatus devised by Vinassa for soil analysis, with comparative experiments, C. BORTOLOTTI (*Staz. Sper. Agr. Ital., 37 (1904), pp. 358–365; abs. in Chem. Centbl., 1904, II, No. 7, p. 614*).—Comparative tests of this apparatus and that of Appiani, which is constructed on the same principle, gave results favoring the new apparatus, especially as regards saving of time and material.

BOTANY.

The influence of nutrition on the sex of diœcious plants, E. LAURENT (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 18, pp. 689–692; abs. in Bot. Centbl., 95 (1904), No. 12, p. 297*).—Experiments have been conducted for 7 years with spinach, hemp, etc., to determine the influence of various fertilizers on the embryo of the plants.

An excess of nitrogen or lime gave an increase in staminate plants, while potash and phosphoric acid increased the number of pistillate ones. Seed produced with an excess of nitrogen gave plants in which pistillate forms predominated, and among those producing monœcious plants most of the flowers were pistillate. With an excess of potash, phosphoric acid, and lime a contrary result was produced.

The stimulating effect of some metallic salts on the growth of plants, M. KANDÁ (*Jour. Col. Sci. Imp. Univ. Tokyo, 19 (1904), Art. 13, pp. 47; abs. in Bot. Centbl., 95 (1904), No. 20, p. 538*).—Copper sulphate in very dilute solutions, which were injurious when applied to pea seedlings in water cultures, when added to humus soils proved not only not injurious to the plants, but exerted a stimulating influence upon their growth.

Zinc sulphate used in a similar way had the same effect. When used in a strength of solution of 0.28 per cent, vetches, which were watered 3 times a week, were decidedly stimulated in their growth. Sodium chlorid, when used in strengths of 0.0002 to 0.002 per cent, was stimulating to plant growth, but when used as concentrated as 0.02 per cent it proved destructive.

Native economic plants of the Transvaal, J. B. DAVY (*Transvaal Agr. Jour., 2 (1904), No. 7, pp. 278–313*).—Notes are given on some of the economic plants which are native and introduced in the Transvaal, attention being called to a number of plants which are reputed as being poisonous, species of troublesome weeds, etc. Brief notes are given on diseases of plants which have been observed, and suggestions given for their prevention. An attempt is made to enumerate some of the more abundant species of plants, giving their vernacular and botanical names.

Commercial plants of Germany, F. W. NEGER (*Die Handelspflanzen Deutschlands, Vienna and Leipzig: A. Hartleben; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 10, p. 637*).

The rôle of alkaloids as a source of nitrogen for plants, L. LUTZ, (*Bul. Soc. Bot. France, 50 (1903), pp. 118–128; abs. in Bot. Centbl., 95 (1904), No. 11, pp. 278, 279*).—Investigations by the author have shown that plants, and especially fungi, when given various alkaloids could utilize them as sources of nitrogen, but a much better growth of plant and greater assimilation of nitrogen resulted when an assimilable form of nitrogen, such as ammoniacal nitrogen, was added to the culture media. This phenomenon was explained by Clautriau as possibly due to the necessity of the fungus making a considerable growth before it was able to utilize the alkaloid.

To test this hypothesis experiments were conducted with various fungi in which they were grown first in culture media containing a nitrogen salt, after which the plants were transferred to a second solution, the only nitrogen of which was in an alkaloid compound.

In every case there was some nitrogen assimilation from the alkaloidal solution, but it was never as great as when the 2 forms of nitrogen were present. It is believed

that when the fungus continued to grow in a second medium and to assimilate the alkaloids it was due to a certain extent at least to the presence of ammoniacal nitrogen in the mycelium enabling the fungus to utilize the nitrogen present in the alkaloid.

From this the author concludes that alkaloids secreted by plants are not to be considered as reserve substances but only as by-products of the plant, and are utilized only under special conditions.

Notes on assimilation by chlorophyll, C. Bernard (*Bot. Centbl. Beihefte, 16 (1904), No. 1, pp. 36–52, figs. 2; abs. in Bot. Centbl., 95 (1904), No. 21, pp. 563, 564*).—Following the methods of Friedel and Macchiati (E. S. R., 14, p. 1047), the author has endeavored to ascertain the power of chlorophyll to carry on photosynthesis when removed from the living plant. Experiments are reported with spinach and various aquatic plants, the tests being made by improved methods, but in every case negative results were obtained. The author concludes that the hypothesis of enzymic action by chlorophyll, as far as his experiments go, is not demonstrated.

The effect of temperature on carbon-dioxid assimilation, Gabrielle L. C. Matthaei (*Proc. Roy. Soc. [London], 72 (1903), No. 483, pp. 355, 356*).—A summary is given of investigations made with cherry-laurel leaves to determine the carbon-dioxid assimilation as affected by temperatures.

These leaves were subjected to temperatures ranging from −6 to 45° C. At each temperature illumination at different intensities was required in order to make certain that the amount of assimilation was not limited by insufficient lighting. When a leaf is exposed to light of high intensity the excess of radiation raises the temperature of the leaf above that indicated by an adjacent thermometer, and under some of the conditions of the experiments this excess amounted to as much as 10° C.

The various precautions adopted to eliminate error in experiments are described, and after taking all factors into consideration it was found that the respiration becomes determinable at −6° C. and then rises rapidly with the higher temperatures up to 38° C. At temperatures above this point the leaf is not capable of maintaining its high rate of assimilation for any length of time, so that the values obtained for successive hourly estimation of the same leaf form a rapidly declining series. The higher the temperature the shorter the duration of the period of maximum assimilation and it becomes impossible to obtain the maximum values at temperatures close to 45° C., which was the fatal temperature for the leaves experimented with. The optimum temperature for assimilation was 38° C.

Some results of cross pollination, Leclerc du Sablon (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 26, pp. 1298, 1299; abs. in Bot. Centbl., 95 (1904), No. 8, p. 180*).—The effect on the carbohydrates in the pericarp of a number of cucurbit species in which the pollen was transferred from one species to another is shown. The author transferred the pollen from melons to melons, from melons to cucumbers, from cucumbers to melons, and from cucumbers to cucumbers.

The fruits produced were analyzed at maturity, and while there was no visible effect due to the cross pollination, yet the melon which resulted from the stimulus of the cucumber pollen did not possess the ordinary sweet taste of melons. An analysis of the pericarp showed that the influence of the cucumber pollen had diminished the sugar content from 24.3 per cent to 5.8 per cent. The contrary cross of melon pollen on cucumber did not result in any increase of sugar in the cucumber. Cross pollination of different varieties of squash are described, in which there was no modification of a morphological character, but a decided diminution of the carbohydrates.

FERMENTATION—BACTERIOLOGY.

A note on the action of radium on micro-organisms, A. B. GREEN (*Proc. Roy. Soc. [London], 73 (1904), No. 494, pp. 375–381, pl. 1*).—Experiments to test the effect of radium bromid on various organisms are reported. The investigations were made to determine the germicidal action of the radium emanations, and in the second place to determine whether the micro-organisms themselves became radioactive.

Fresh calf vaccine which contained 4 species of extraneous bacteria, and about 2 dozen species of miscellaneous bacteria were subjected to the action of radium bromid, and it was found that the radium exerted a marked germicidal action on the specific and extraneous micro-organisms of vaccine, as well as upon the other organisms when exposed to radium at a distance varying from 1 to 2 mm.

The details of the experiments are given at some length, and it was found that while the micro-organisms which had been killed by exposure to radium became radio-active it was not ascertained whether the living ones could exhibit that property.

Investigations on the ferments causing depreciation of wines, P. MAZÉ and P. PACOTTET (*Rev. Vit., 21 (1904), Nos. 541, pp. 461–563; 542, pp. 489–494; 543, pp. 517–519; 544, pp. 545–548, pl. 1, figs. 6*).—A brief summary is given of the work of a number of prominent investigators on the ferments which cause the deterioration of wines, after which the methods of isolation and study are described. A number of the more common forms are figured and described and their effect on various wines and other media shown.

The effect of aniline colors on invertin, S. S. MERESHKOWSKY (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 2, pp. 33–45*).—In order to determine the effect of various coloring materials on ferments, the author conducted a series of experiments in which the effect of fuchsin, Congo red, and safranin on invertin was investigated.

The experiments are reported in detail and it was found that the anilin coloring materials undoubtedly had a direct action on invertin in proportion to the molecular structure of the coloring matter. It appeared that invertin in the presence of anilin colors of known concentration is not destroyed, but there is set up an unstable compound that acts indifferently toward cane sugar. If, however, a fresh solution of sugar be added to the mixture the former compound is broken up and part or all of the invertin is liberated.

The preparation of nutrient media for the cultivation of bacteria, G. HESSE (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 1, pp. 1–22*).—As the result of an elaborate study of this subject, during which various bacteria were grown on different media contained in different kinds of glass, the author recommends that in sterilizing culture media glassware be used which does not yield alkali.

For determining the reaction of nutrient media phenolphthalein is considered a much more delicate reagent than litmus paper. The author believes that this is the only method by which the alkali content of a culture can be accurately determined as well as the proper amount to be added to any particular culture. The proper reaction of the medium should be brought about while the material is at a temperature of 40° C.

A method of cultivating anaerobic bacteria, J. BORDET (*Ann. Inst. Pasteur, 18 (1904), No. 5, pp. 332–336, figs. 2*).—Most methods proposed for the cultivation of anaerobic bacteria suffer from the disadvantage of requiring complicated apparatus. The author attempted to devise a simplified method. The test tubes and flasks are placed in bell jars from which the air is exhausted by the use of air pump and pyrogallate of potash. The technical cultural details are carefully described. The method has given good results with the tetanus bacillus.

Mucin as a bacterial product, L. F. Rettger (*Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 16; reprinted from Jour. Med. Research, 10 (1903), No. 1, pp. 101–108*).—The possibility of the occurrence of mucin as a bacterial product was suggested to the author and a series of investigations reported in which *Bacterium subriscosum* was grown in various media. After growing for some time the substance formed was separated by precipitation and filtration and subjected to analysis.

The organism grew rapidly in 1 to 2 per cent peptone solutions, although the amount of mucin formed was considerably less than when growth occurred in beef bouillon or in milk. It was found that the production of mucin did not depend upon the presence of carbohydrate material in the medium. The addition of varying quantities of dextrose, levulose, lactose, etc., to the bouillon did not perceptibly increase the amount of mucin formed.

Further investigations showed that the production of mucin or a mucin-like substance is not limited to a single species of bacteria, but is a property possessed by many, if not all, though in most cases the quantity of mucin formed was so small as to be scarcely perceptible. There was found evidence that the process of mucin production by bacteria is not a direct one and there is presumably formed an intermediate body called a pseudomucin. As development goes on this peculiar substance becomes transformed into the more soluble form of mucin. All attempts to isolate this intermediate body by cultural methods have thus far been unsuccessful.

The agglutination affinities of related bacteria parasitic in different hosts, T. Smith and A. L. Reagh (*Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 12; reprinted from Jour. Med. Research, 9 (1903), No. 3, pp. 270–300, dgms. 3*).—The fact that there are races of bacteria indistinguishable among themselves except in inconstant cultural details has led to a number of studies to determine their affinities. In the present paper the authors give a history of the cultural tests made with hog-cholera organisms, several varieties of *Bacillus coli communis*, typhoid bacillus, *B. icteroides*, etc., in which they conclude that there exists agglutination relationships between the pathogenic groups of bacteria, which ferment dextrose, as given in their experiments.

The agglutinative characters are probably modified when the bacillus becomes parasitic on different hosts. Close agglutinative affinities may be predicted from close biological and pathogenic relationships. Minor cultural differences do not exclude agglutinative affinities.

It appears that closely related bacteria vegetating on mucus membranes may vary considerably in their agglutinative relationships, differing in this regard from species whose varieties or races are more homogeneous. The specific agglutinative properties of the different races of bacteria studied are described. A bibliography of about 20 publications relating to the subject completes the paper.

The nonidentity of agglutinins acting upon the flagella and upon the body of bacteria, T. Smith and A. L. Reagh (*Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 18; reprinted from Jour. Med. Research, 10 (1903), No. 1, pp. 89–100*).—A study of the agglutinins of the hog-cholera bacillus and other organisms has led to the conclusion that the nonmotile race and the motile races manifest a close affinity toward each other in the presence of immune agglutinins.

This affinity makes it possible to differentiate the agglutinins of motile bacilli into flagellar and body agglutinins. The assumption of 2 agglutinins, it is said, will probably serve to clear up various discrepancies in agglutination tests.

The bacilli of the root tubercles of red clover, L. Petri (*Nuovo Gior. Bot. Ital., n. ser., 10 (1903), p. 272; abs. in Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 10–11, pp. 347, 348*).—It is said that from young root tubercles of red clover at the time of the most active growth of the host plant, the author isolated an organism which he has cultivated upon various media and reported the cultural characteristics. The

bacteria are characterized by a capsule which surrounds them, and while very abundant in the young root tubercles do not seem to occur in the soil surrounding them. The affinities of the organism are described and the author gives it the name *Bacillus capsulatus trifolii*, n. var.

The bacterial flora of cultivated soils, L. HILTNER and K. STÖRMER (*Mitt. Deut. Landw. Gesell.*, *18* (*1903*), *Nos. 48*, *pp. 266–268; 49*, *pp. 270, 271*).—This is a summary of a longer article,[a] discussing especially methods used in the bacteriological examination of soils, the causes of the increased productiveness of soils following treatment with carbon bisulphid, and the character and growth of micro-organisms in fallow soil.

The influence of carbohydrates on the gas exchange of yeast, E. KOLLEGORSKY and O. ZASSOUCHINE (*Centbl. Bakt. u. Par.*, *2. Abt.*, *11* (*1903*), *No. 3*, *pp. 95–105*).—The results of experiments in determining the effect of various carbohydrates on the respiration of yeast are given. The authors added to the culture media glucose, fructose, maltose, saccharose, raffinose, various alcohols, glycerin, and mannite, cultivating in the media *Saccharomyces cerevisiæ I* and *Schizosaccharomyces pombe*. The experiment shows that the proportion between the carbon dioxid and oxygen varied with the different carbohydrates added to the culture media. The details of the investigation are given in tabular form.

A study of the proteolytic enzyms of malt, R. VANDERVAEREN (*Rev. Gén. Agron.* [*Louvain*], *12* (*1903*), *No. 12*, *pp. 512–514*).—A brief note of experiments carried on by Weis at the Carlsberg-Copenhagen Laboratory of Physiology.

On the chemical nature of the oxydases, K. ASO (*Bul. Col. Agr. Tokyo, Imp. Univ.*, *5* (*1903*), *No. 4*, *pp. 481–489*).—A critical review is given of various opinions regarding the chemical nature of oxydases and the results of the author's investigations with buds of the potato and other plants from which the conclusion is drawn that it is very improbable that the oxydase and peroxidase of plant juice are organic peroxids. In the experiments reported the liberation of iodin by plant juices was found to be due to traces of nitrites in the plants, and it is believed that these are present in other plant juices.

Studies of the proteolytic enzyms of germinating barley, F. WEIS (*Copenhagen: 1902*).—A thesis presented for the degree of Ph. D. Essentially the same article has been noted elsewhere (E. S. R., 15, p. 452).

The rapidity of enzymic reactions, R. O. HERZOG (*Ztschr. Physiol. Chem.*, *41* (*1904*), *No. 5*, *pp. 416–424*).—The rapidity of enzymic reaction, according to the author, is dependent upon rate of diffusion. A formula for calculating it is given and discussed.

ZOOLOGY.

On the bearing of Mendelian principles of heredity on current theories of the origin of species, A. D. DARBISHIRE (*Reprinted from Mem. Manchester Lit. and Phil. Soc.*, *48* (*1904*), *pt. 3*, *No. 24*, *pp. 19–31*).—Notes are given on the difference between the continuous and discontinuous variation, and the theories of Galton and Mendel for explaining the inheritance of specific characters are briefly described. A bibliography of the subject is appended to the article.

Forest zoology, K. ECKSTEIN (*Allg. Forst u. Jagd Ztg.*, *1903*, *Sup.*, *pp. 71–83*).—Brief notes are given on work along the line of forest zoology in various parts of Germany for 1903. Attention was devoted to injurious mammals, birds, and insects.

Rabbits for profit, J. T. BIRD (*London: W. H. & L. Collingridge*, *1904*, *pp. 110*, *figs. 33*).—This volume is intended to contain the most recent and practical information regarding the various phases of rabbit raising with notes on breeds, foods, methods of feeding, rearing and housing, marketing of rabbits in a living and dead condition, and the common diseases of rabbits. The book is illustrated.

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[a] Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 5, pp. 445–545.

Wyoming ground squirrels (*Ranchman's Reminder, 1 (1904), No. 6, pp. 74–77, figs. 2*).—Brief notes on the appearance and distribution of ground squirrels in Wyoming with an account of injuries to various cultivated crops. For destroying these pests fumigation with carbon bisulphid is recommended.

The land and sea mammals of middle America and the West Indies, D. G. ELLIOT (*Field Columbian Mus., Zool. Ser., 4 (1904), pt. 1–2, pp. LXXXIII+850, pls. 58, figs. 309*).—The purpose of this report is to present an account of all the mammals of the North American continent and adjacent islands and seas from the northern boundary of Mexico to the Province of Cauca, South America. Analytical keys are presented for the determination of the species and a detailed description is given of each species of mammals.

Regulations for the protection of game in Alaska for the year 1904, J. WILSON (*U. S. Dept. Agr., Division of Biological Survey Circ. 42, pp. 6*).—A copy is given of an act for the protection of game in Alaska. This act was passed for the purpose of stopping the exportation of deer hides from Alaska and the killing and shipment of big game as trophies. The act is fulfilling its purpose in this regard. On the basis of this act, the Secretary of Agriculture is empowered to promulgate regulations from time to time regarding the seasons, permits, shipments, and transportation of game in Alaska. The regulations for 1904 are included in the circular.

Regulations for the protection of game in Alaska, J. WILSON (*U. S. Dept. Agr., Division of Biological Survey Circ. 39, pp. 6*).—This circular contains a copy of an act for the protection of game in Alaska together with regulations adopted by this Department for the execution of the game law.

Directory of State officials and organizations concerned with the protection of birds and game, 1903, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Circ. 40, rev. ed., pp. 12*).—Lists are presented of State officials, National organizations, State organizations, and Audubon societies concerned with the protection of birds and game in the United States and Canada.

Directory of State officials and organizations concerned with the protection of birds and game, 1904, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Circ. 44, pp. 15*).—As in previous circulars on this subject the addresses are given under four heads—State officials, National organizations, State organizations, and Audubon societies. Brief notes are also given on the methods adopted in the different States for the protection of game.

Definitions of open and close seasons for game, H. OLDYS (*U. S. Dept. Agr., Division of Biological Survey Circ. 43, pp. 8*).—Considerable lack of uniformity prevails in the statement of open and close seasons for game in the various States. It has been found doubtful in certain laws whether it is intended to include or exclude the dates mentioned at the beginning and expiration of open season. Greater uniformity in this matter is urged, together with a definite statement of the use of such prepositions as to, between, from, until, etc., in this connection.

Destruction of vermin (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 46, 47*).—Great losses to small stock and ostrich farming are reported from attacks of jackals and various methods are suggested for the destruction of these animals. It is recommended that jackal-proof fences be adopted as extensively as possible and that the poisoning method recommended by the Government be further applied.

Batrachians and reptiles of Ohio, M. MORSE (*Ohio State Univ. Bul., 8. ser., No. 18, pp. 91–144, pl. 1*).—A detailed list is presented of all the batrachians and reptiles known to occur in the State of Ohio together with artificial keys for the determination of the species, bibliographical references, directions for collecting and preserving these animals and a glossary of scientific terms.

A physiological theory to explain the winter whitening of birds and mammals in snowy countries, and the most striking points in the distribution of white in vertebrates generally, G. E. H. BARRETT-HAMILTON (*Rpt. British Assoc.*

Adv. Sci. 1903, pp. 698, 699).—In the author's opinion the belief that the winter whitening of animals takes place under the action of natural selection for protective purposes is not well founded. It is argued that this change possesses a deep physiological significance. The author noted a distinct sequence in which different parts of the body become white. On the whole this sequence corresponds to the parts in which the summer accumulation of fat takes place.

Attention is called to the fact that the belly of many animals where peripheral fat is thickest is permanently white and that the rump which usually shows the next thickest accumulation of fat is the first to become white in winter. The whitening of the feathers and hair is explained as a loss of pigment due to fat deposition and consequent atrophy. Many instances of white patches of hair, such as white face on the horse and white facial stripes on the badger are explained on the basis that they are located immediately over bone and thin membranes in which the circulation is not very vigorous and where atrophy and loss of pigmentation are likely to occur.

A handbook of the genera and species of birds, IV, R. B. Sharpe (*London: British Mus. Nat. Hist., 1903, pp. 391*).—In this volume the list of passerine birds is continued down to the end of the family Certhiidæ. It is stated that the work will be completed in one more volume.

Destruction of birds of prey, J. Aguet (*Jour. Agr. Prat., n. ser., 8 (1904), No. 35, p. 283*).—Attention is called to the wanton destruction of birds of prey and notes are given on the feeding habits of these birds, particularly their agency in the destruction of injurious rodents.

The protection of birds useful to agriculture, A. Meraz (*Com. Parasit. Agr. [Mexico], Circ. 8, pp. 21, figs. 8*).—Notes are given on the economic relations of a number of species of birds belonging to the various families.

Useful birds on the farm, how to attract and protect them, E. H. Forbush (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 187–212, pls. 2, figs. 6*).—A brief account is presented of the economic importance of the birds with especial reference to their agency in destroying the injurious insects of wood lots, orchards, fields, and gardens. The majority of common birds are considered as being more beneficial than injurious, and suggestions are therefore made regarding methods of attracting these birds to orchards and gardens and protecting them in such situations.

The useful and injurious birds of New Jersey, S. N. Rhoads (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 212–225*).—In the author's opinion the terms useful and injurious as applied to birds have not been defined with sufficient clearness and are therefore used quite loosely. As a rule, birds are believed to do more good than harm with the exception of the English sparrow, and more interest in their preservation is urgently recommended.

The birds of St. Vincent (*West Indian Bul., 5 (1904), No. 1, pp. 75–95*).—A brief account is presented of the geological conditions of St. Vincent with reference to the distribution of birds. The game birds of the islands are enumerated and described, and a list of birds including 84 species is presented. A copy is also given of an ordinance for the protection of birds.

[Bird migration], C. H. Merriam (*U. S. Dept. Agr., Division of Biological Survey Circ. 41, p. 1*).—Correspondents of the Department are requested to furnish notes regarding the dates of appearance and other facts noted concerning nighthawks, catbirds, kingbirds, red-eyed vireo, and redstart.

Bird migration in Great Britain and Ireland, A. Newton et al. (*Rpt. British Assoc. Adv. Sci., 1903, pp. 289–304*).—This constitutes the sixth and final report of the committee on bird migration. Particular attention is given in a statement furnished by W. E. Clarke to the migrations of the starling and rook.

Introduction of bats, L. G. Blackman (*Hawaiian Forester and Agr., 1 (1904), No. 5, pp. 115–117*).—Attention is called to the feeding habits of insectivorous bats and the possible benefits which might be derived from the importation of such bats.

It is suggested that the proper authorities make a study of this problem for the purpose of learning whether such introduction would be desirable.

Owls in their relation to agriculture (*Jour. Jamaica Agr. Soc., 8 (1904), No. 8, pp. 324–326*).—Brief notes are given on the habits of owls with especial reference to their economic importance. As a rule these birds are believed to render considerable assistance to agriculture in the destruction of injurious animals.

METEOROLOGY—CLIMATOLOGY.

Relation of weather to crops, A. J. McClatchie (*Arizona Sta. Bul. 48, pp. 345–456, pl. 1, fig. 1*).—This bulletin summarizes and discusses observations at the experiment farm near Phoenix during the past six years. The principal facts recorded are in brief as follows:

"The climate of an arid inland region is characterized by greater extremes of heat and cold than that of a humid coast region in the latitude, the winters being cooler and the summers warmer, and the difference between the temperatures of day and night greater. The climate at the station farm is a typical inland climate, and very trying on a large number of crops grown in the same latitude in a moist climate. If planted at the proper time, nearly all the crops grown in the temperate regions may be grown here more or less successfully.

"The small grains do well during winter, Indian corn fairly well during spring and fall, and Egyptian corn does well during summer. Few legumes are profitably grown here, peas doing fairly well during winter and cowpeas fairly well during summer. Cotton and sugar beets grow fairly well, but require a great deal of water at a time of the year when it is ordinarily scarce.

"The forage crops grown most successfully are alfalfa, small grains, and sorghum, the three furnishing green feed throughout the year. The most useful green manuring crop is what is known here as 'sour clover,' and to botanists as *Melilotus indica*. Most garden vegetables can be grown here quite successfully during winter and spring, those for which the climate is especially unsuited being winter squashes, beans, and rhubarb.

"No small fruits are generally grown with success, though strawberries were formerly grown in abundance and are still grown to a limited extent. Of deciduous fruits, grapes, peaches, apricots, plums and pears are successfully grown, while cherries and apples are grown with difficulty. The only nut-producing tree that thrives here is the almond. Citrus fruits do fairly well, but have not proven to be a reliable crop for profit. Olives and dates seem especially well adapted to the climate, and promise to be profitable crops. The cottonwood is the most easily grown timber tree, though the ash and a few species of Eucalypts grow quite well.

"Records from instruments located at different elevations from the ground show the importance of taking the situation of instruments into consideration in judging of the effect of recorded temperatures upon crops. Minimum temperatures average four or five degrees lower in government shelter 5 ft. from the ground than in the same shelter 50 ft. from the ground, and about three degrees lower at the ground than at the former point. Maximum temperatures average about three degrees higher 5 ft. from the ground than at 50 ft. from the ground, and ten to twelve degrees higher a few inches above the ground than at former location.

"The annual and the diurnal range of temperature is greatest at the surface of the ground, and decreases from there upwards and downwards. The lowest recorded temperature at 5 ft. underground has been 53; at 10 ft. underground 56, and at 15 ft. 58. The highest temperatures at these points have been 88, 76, and 73. Evaporation from a water surface ranges from a little over an inch per month during the coolest, dampest part of the year to over 10 inches during the warmest and driest part.

"Weather changes that are not periodic are due to inequalities in the density of the atmosphere. The indications of rain are: East or southeast wind, decreased diurnal range of temperature, slower evaporation, sinking of smoke or vapor. The indications of frost or cool weather are: West wind, increased diurnal range of temperature, rapid evaporation, clear sky. Grains hardy to frost are grown from October to June, and grains sensitive to frost from March to November. Melons grow from March to November, potatoes from February to June, and from August to December; tomatoes from March to December; corn from March to June and from July to November. Alfalfa grows some all the year, but makes the most growth from February to July and from September to November. Deciduous fruit trees grow from February to July, and evergreen fruit trees from March to July, and from September to December. Owing to the warm, dry climate insect pests and fungus diseases of plants are rare in the region."

A world-wide barometric seesaw, W. J. S. LOCKYER (*Nature [London], 70 (1904), No. 1808, pp. 177, 178, figs. 2*).—In this article an attempt is made to define the boundaries of two nearly antipodal parts of the earth in which barometric pressure varies in an inverse way. "So far as can at present be determined, one line commencing to the west of Alaska, separating this region from Siberia, passes easterly along about the 60th parallel of latitude, and runs in a southeasterly direction between southwest Greenland and northeast Canada. It then crosses the North Atlantic, passing to the north of the Azores, and skirts the southwestern portion of Portugal. It then strikes down towards the equator, cutting northwest Africa, so far as can be judged from the scant pressure values available, through the middle of the Sahara. It leaves Africa near the Gold Coast, and passes into the South Atlantic, where it can not be traced further owing to lack of observations in this southern ocean.

"The other boundary or neutral line passes to the northeast of Greenland and north of Iceland, crosses the southern portion of Norway and Sweden, and traverses southern European Russia. It then takes a course somewhat more easterly, skirting the northern part of the Caspian Sea and Turkestan, passes between Tibet and Mongolia, and through China. It then leaves the continent a little to the south of the Yellow Sea, and passes into the North Pacific Ocean. Here its path can not be traced, but it evidently passes well to the east of the Philippine Islands and Solomon Islands, takes a new southwesterly course, skirting the eastern side of Australia and passing between Tasmania and New Zealand. Its track is then again lost in the southern Pacific Ocean.

"Although too much weight must not at present be given to the positions of these neutral lines throughout their whole length, it is interesting to note that they are fairly symmetrical to one another, although no attempt has been made to make them so. Both lines apparently cross the equator at about antipodal points, and both appear to have a similar trend in northern and southern latitudes.

"The result of this survey seems to indicate clearly that there exists a general law relating to the pressure changes which occur simultaneously in these two extensive regions of the globe separated and defined more or less by a neutral line, this latter forming a fulcrum about which seesaws of pressure from one region to another take place.

Monthly Weather Review (*Mo. Weather Rev., 32 (1904), Nos. 4, pp. 159–206, figs. 4, charts 20; 5, pp. 207–254, figs. 5, charts 15; 6, pp. 255–301, figs. 6, charts 13*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of April, May, and June, 1904, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 4.—Special contributions on Application of Salts of Radium to the Study of Atmospheric Electricity (illus.), by T. Moureaux; Studies on the Circulation of the Atmospheres of the Sun and of the Earth—V.—Results of the Nephoscope Observations in the West Indies during the years 1899–1903 (illus.), by F. H. Bigelow; The

Measurement and Utilization of Fog, by P. Leonard; The Formation of Snow in Cloudless Air near the Ground, by J. N. Weed; The Energy of a Unit of Light, by E. Buckingham; Meteor of September 15, 1902, by E. L. Moseley; Barometric Pressure at Orono, Me., by J. S. Stevens; Origin of American Cold Waves, by R. F. Stupart; Increased flow of Spring Water in the Autumn, by G. A. Loveland; The Temperature of the Air above Berlin (illus.), by R. Assmann; and notes on planetary meteorology; Weather Bureau men as instructors; meteorology in the universities; the observatory at Nice; and hypotheses as to the cause of the aurora borealis.

No. 5.—Special contributions on Studies on the Circulation of the Atmospheres of the Sun and of the Earth—VI.—The Circulation in Cyclones and Anticyclones, with Precepts for Forecasting by Auxiliary Charts on the 3,500-Foot and the 10,000-Foot Planes (illus.), by F. H. Bigelow; The Sensation of Discomfort, by W. F. Tyler; The Pressure of Sunlight and some of its Bearings on Astronomy and Meteorology, by S. A. Mitchell; The Promotion of Meteorology; Relation of Precipitation to Yield of Corn (illus.), by J. W. Smith (E. S. R., 16 p. 136); Invariability of our Winter Climate, by W. B. Stockman; The Crow Creek Flood of May 20, 1904, at Cheyenne, Wyo., by W. S. Palmer; and notes on the tornado in Indian Territory; tornado at Grand Rapids, Mich.; local cooperation in forest prevention; the triennial meeting, April, 1904, of the German Meteorological Society; the meteorology of the upper air; the meteorology of Jamaica; the curious work of the wind; instruction in meteorology; humming of telegraph wires and poles; note on the great meteor of September 15, 1902; and Weather Bureau men as instructors.

No. 6.—Special contributions on Frederic Henry Clarke; Earthquakes of June 25 and 26, 1904, by C. F. Marvin; Studies on the Circulation of the Atmospheres of the Sun and of the Earth—VII.—The Average Monthly Vectors of the General Circulation in the United States, by F. H. Bigelow; On the General Circulation of the Atmosphere in Middle and Higher Latitudes (illus.), by W. N. Shaw; Hourly Climatic Records on the Isthmus of Panama (illus.), by H. L. Abbot; Cyclonic Depression and Flood in Jamaica, by M. Hall; The First Electric Storm Recorded Automatically in St. Louis, Mo. (illus.), by J. Algué; and notes on temperatures in the upper atmosphere; auroras and thunderstorms; meteorology in Austria; Weather Bureau men as instructors; meteorology in the colleges and universities; and Silas West.

Weather reports, A. J. Mitchell (*Florida Dept. Agr. Mo. Bul. 14 (1904), Nos. 1, pp. 15–22; 2, pp. 17–24; 3, pp. 17–24; 4, pp. 17–24*).—Summaries of observations on temperature, precipitation, frosts, etc., at different points in Florida during January, February, March, and April, 1904.

Report on the weather of 1902 and 1903, J. W. Paterson (*West of Scotland Agr. Col. Bul. 19, pp. 15*).—This report gives a record of rainfall, temperature, and sunshine and general notes on the weather of each month at Kilmarnock and Glasgow during the years 1902 and 1903.

The [Philippine] Weather Bureau, D. C. Worcester (*Philippine Com. Rpt. 1903, pt. 2, pp. 55–58*).—A brief account of organization, equipment, and lines of work.

Report of the director of the Philippine Weather Bureau for the year ending August 31, 1903, J. Algué (*Philippine Com. Rpt. 1903, pt. 2, pp. 743–768, pls. 5*).—An account is given of the erection of new stations, inspection of stations, new instruments in the central observatory and branch stations, telegraphic service and work in branch stations, earthquake records, crop service, typhoon signals, publications, and astronomical and magnetic observations.

Meteorological observations, W. T. Ellis, R. Robertson, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpt. 1903, pp. 47, 48, 263, 264, 298, 353, 396, 427*).—Summaries are given of observations on temperature, precipitation, etc., during 1903, at Central Experimental Farm, Ottawa; Nappan, Nova Scotia; Brandon, Manitoba; Indian Head, Northwest Territories; and Agassiz, British Columbia.

Meteorological observations in Sweden, 1902, H. E. Hamberg (*Meteor. Iakttag. Sverige [Observ. Météor. Suédoises], K. Svenska Vetensk. Akad., 44 (1902), pp. X+157*).—This is one of the series of reports of meteorological observations made under the direction of the Central Meteorological Institute and published by the Royal Academy of Sciences of Sweden.

It includes summaries of daily observations at 18 stations of the second order, monthly and annual summaries, general observations for 39 stations of the second order, the latter being also summarized in five-day periods. The results of observations on temperature alone are reported from 89 stations of the third order. The location, altitude, etc., of the stations are given, and some of the apparatus used and the methods of calculating results are described.

Observations on the mean distribution of rainfall in the Department of Gironde, G. Rayet (*Mém. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 3 (1903), pp. 37–51, chart 1*).—Observations at different places (1892–1901) are summarized.

Rainfall in the Duff development concession during 1903, J. D. Gimlette and M. E. Scriven (*Agr. Bul. Straits and Federated Malay States, 3 (1904), I, No. 6, p. 235*).—The monthly rainfall and the greatest rainfall during 24 hours are given for the period of May to December, inclusive.

Rainfall measurements in Usambara, C. Uhlig (*Ber. Land. u. Forstw. Deutsch-Ostafrika, 1 (1903), No. 7, pp. 467–563, dgm. 1*).—The literature of meteorological observations in German East Africa is reviewed and all available measurements of rainfall are summarized and discussed.

Requirements of productive trees which can grow in arid countries without summer irrigation, P. Gennadius (*Cyprus Jour., 1 (1904), No. 1, pp. 6, 7*).—A summary is given of rainfall observations at 6 stations in the Island of Cyprus during the years 1881–2 to 1901–2. The average rainfall of the Island during the period was 17.45 in.

AIR—WATER—SOILS.

On the formaldehyde of the air, H. Henriet (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 1, pp. 67, 68*).—Replying to Gautier's statement that air containing as much formaldehyde (2 to 6 gm. per 100 cubic meters of air) as the author reported in a previous paper would not be respirable, the author discusses the possibility of the presence of a polymer of formaldehyde in the air which yields the latter under the conditions of the method used in determining formaldehyde.

Observations at the Franco-Scandinavian station for exploration of the air at Hald (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 26, pp. 1736–1737*).—A brief account of observations by means of kites and balloons.

A method of destroying or preventing the growth of algæ and certain pathogenic bacteria in water supplies, G. T. Moore and K. F. Kellerman (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 64, pp. 44*).—This bulletin records the results of investigations begun in 1901, and which have included microscopic examinations of water with reference to nature and distribution of objectionable algæ and methods of removing them and studies of the effect of copper sulphate, colloidal copper, and other disinfectants on algæ and pathogenic bacteria. The nature and scope of the investigations and of the results reported are indicated in the following summary:

"The disagreeable odors and tastes so often present in drinking water are due almost exclusively to algæ, although the economic importance of studying these plants has not been recognized until recent years.

"These algal forms are widely distributed, and reservoirs in many States have been rendered unfit for use by their presence.

"The methods now known for preventing or removing the odors and tastes caused by algæ have proved unsatisfactory, either because of prohibitive expense or failure to accomplish result.

"It is therefore desirable that some new, cheap, harmless, and effective method be devised for ridding reservoirs of these pests.

"It has been found that copper sulphate in a dilution so great as to be colorless, tasteless, and harmless to man is sufficiently toxic to the algæ to destroy or prevent their appearance.

"The mode of application makes this method applicable to reservoirs of all kinds, pleasure ponds and lakes, fish ponds, oyster beds, water-cress beds, etc. It is also probable that the method can be used for the destruction of mosquito larvæ.

"At ordinary temperatures 1 part of copper sulphate to 100,000 parts of water destroys typhoid and cholera germs in from 3 to 4 hours. The ease with which the sulphate can then be eliminated from the water seems to offer a practical method of sterilizing large bodies of water, when this becomes necessary.

"The use of copper sulphate for the prevention of disease is regarded as incidental and is not designed in any way to supplant efficient preventive measures now in use. It is believed, however, that up to this time no such satisfactory means of thoroughly, rapidly, and cheaply sterilizing a reservoir has been known. Since the selective toxicity of copper sulphate renders it fatal to pathogenic forms peculiar to water, while the saprophytic or beneficial bacteria are unaffected, the method is particularly well adapted for this purpose.

"Definite knowledge in regard to what organisms are present, the constitution of the water, its temperature, and other important facts are necessary before it is possible to determine the proper amount of copper sulphate to be added. A microscopical examination thus becomes as important as a bacteriological or chemical analysis.

"No rule for determining the amount of copper sulphate to be added can be given. Each body of water must be treated in the light of its special conditions.

"The cost of material for exterminating algæ will not exceed 50 to 60 cts. per million gallons and will usually be less. The destruction of pathogenic bacteria requires an expenditure of from $5 to $8 per million gallons, not including the cost of labor."

Some refined methods in water purification, W. G. Toplis (*Amer. Jour. Pharm., 76 (1904), No. 3, pp. 116–121*).—A general discussion of some features of bacteriological examination of water, including a description of a filter of slag and sponge clippings in use at the lower Roxborough filter plant on the Schuylkill River.

Some water analyses, J. Sebelien (*Ber. Norges Landbr. Hoiskoles Virks., 1902–3, pp. 171–177*).—The paper reports and discusses the results of monthly examinations of water of different origin used for various purposes at the Agricultural College of Norway.—F. W. Woll.

Well waters from farm homesteads, F. T. Shutt (*Canada Expt. Farms Rpts. 1903, pp. 158–161*).—The results of analyses with reference to sanitary condition of 55 samples of water from miscellaneous sources are reported.

Cooperative fertilizer experiments on moor soils, 1903, H. von Feilitzen (*Svensk Mosskult. Tidskr., 18 (1904), No. 3, pp. 157–170*).—The report contains a brief account of the fertilizer experiments conducted under the direction of the Swedish Moor Culture Association during 1903. Fifty-five different trials were conducted in all, in 17 different counties, with small grains, legumes, roots, and tubers. The practical results of the trials are summarized at the end of the report, and brief general directions for the best methods of cultivation of moor soils are given.—F. W. Woll.

Soils, T. S. Dymond and F. Hughes (*Essex Education Com., Notes Agr. Anal. County Tech. Labs., 1904, pp. 7–15, 32, 33*).—Mechanical and chemical analyses of 24 samples of soil are reported and discussed with reference to their requirements for the production of different kinds of crops. The analysis of a sample of the soil from the celebrated potato-growing district near Dunbar, in Essex, shows the presence of high percentages of organic matter, nitrogen, available phosphoric acid, and lime, but only about the average amount of potash.

A study of the nitrogen content of a soil which has been continuously fertilized during 4 years shows that in 3 out of 4 cases nitrate of soda and superphosphate of lime have decreased the amount of nitrogen in the soil, basic slag has in every case increased and lime decreased it, and farm manure has in 2 cases increased and in 2 cases decreased it. Superphosphate and basic slag has in every case increased the proportion of clovers in the herbage. Lime has also increased the proportion, but to a less extent. Barnyard manure has decreased the proportion of clovers in 2 out of 3 cases and nitrate of soda in every case.

The exports of Jamaica in relation to the soil, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 6, pp. 127–132*).—The results of analyses of 34 samples of material representing typical exports of the Island of Jamaica are reported and discussed with reference to "the actual drain on the mineral elements of the soil fertility of Jamaica by the annual removal of phosphoric acid and potash in the exports of the island." The average results show that 2,865,522 lbs. of potash and 896,712 lbs. of phosphoric acid are annually removed from the island in its exports.

Rhodesian soil analysis (*Rhodesian Agr. Jour., 1 (1904), No. 6, pp. 165, 166*).—The averages of 12 samples each of the typical red and granite soils of southern Rhodesia, which are remarkably uniform in chemical composition, are reported.

The conservation of moisture in orchard soils, F. T. SHUTT (*Canada Expt. Farms Rpts. 1903, pp. 129–132*).—This is a continuation during 1903 of previous years' investigations (E. S. R., 15, p. 126). The results of determinations May 14 and 23 and June 5 of moisture in different plats in the station orchard, which had been (1) under cultivation during the last 2 seasons, (2) in sod during the last 2 seasons, and (3) in sod in 1902, but plowed early in the season of 1903 (April 13), disked May 29, and cultivated June 3, are reported in comparison with data for precipitation during the same period. The results emphasize the value of cultivation as a means of conserving moisture.

The behavior of certain nitrogenous organic substances in the soil, A. MENOZZI (*Ric. Lab. Chim. Agr. R. Scuola Sup. Agr., Milan, 2 (1903), pp. 29–34*).—Studies of the absorptive power of a soil for sodium urate are briefly reported.

Investigation in soil bacteriology and its importance in determining the fertility of soils, P. EHRENBERG (*Landw. Jahrb., 33 (1904), No. 1, pp. 1–139; abs. in Chem. Ztg., 28 (1904), No. 45, Repert. No. 13, p. 159; Chem. Centbl., 1904, II, No. 25, p. 1615*).—On 5 soils, 2 of which were designated abnormal (very unproductive) and 3 of which by various treatments—manuring, etc.—were made productive, the author attempted to study the nitrogen utilization, loss, and combination, especially the extent to which these may be determined by bacteriological studies. In connection with vegetation experiments, some of which were made in the field, soils before and after the growth of crops were studied as to putrefaction capacity by Remy's method, for denitrifying power with Giltay's solution, nitrifying power (both nitrites and nitrates) according to Omeliansky, nitrogen-collecting capacity from the air by means of mannite solution according to Beijerinck.

Experiments were undertaken to improve the abnormal soils by inoculation, applications of manure, lime, and marl, as well as by modifying the climatic conditions. From the large mass of data obtained the following general conclusions are drawn: The phrase "bacteriologically abnormal soils" is not strictly accurate as applied to the soils studied in these investigations. Their unproductiveness was apparently due mainly to a deficiency of lime, which injuriously affected the growth of both the higher and the lower plants.

Inoculation with different kinds of soil bacteria, exclusive of the root tubercle bacteria, even in connection with applications of lime and manure did not bring about an appreciable effect. In the interpretation of vegetation experiments the plant species as well as its inherent capacity for assimilating plant food and requirements in this respect are of the highest importance, especially as regards lime. The

stirring of the soil in filling the pots and in making pot experiments does not appear to appreciably affect the bacteriological properties of the soil. The effect of manure can not be explained by its content of nitrogen and organic matter, especially when it is used on soils poor in lime.

While the results of the experiments reported show that the abnormal character of the soils was not of a bacteriological nature, they show in other respects the importance of bacteriological studies of soils—for example, the generally close relation between lime content and the activity of the soil bacteria. In an appendix the author gives a large number of suggestions and directions for the improvement of methods of bacteriological investigation of soils.

Studies on the bacterial flora of cultivated soils with especial reference to their behavior under fallow and when treated with carbon bisulphid, L. HILTNER and K. STÖRMER (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 5, pp. 443–545, pls. 2, figs. 4*).—This is a comprehensive report dealing with methods of bacteriological examination of soils, the action of carbon bisulphid on the bacterial life of soils, and bacteriological studies of fallow soils. The methods of investigation which have been proposed by various investigators are critically reviewed and modifications suggested by the authors' work are described.

It is stated that the investigations show that carbon bisulphid exerts a selective action on the micro-organisms of the soil, retarding the action of some and promoting the activity of others. The action of the bisulphid was apparently beneficial in delaying nitrification at a time when the nitrates could not be completely utilized by the plants and were likely to be carried away in the drainage water. While the results of studies on fallow soils were not considered conclusive, they show in general that there was a decline in total number of organisms in the fallow plats, this being due exclusively to disappearance of organisms which do not liquefy gelatin.

Bacteriological and chemical studies of soils, WOHLTMANN, FISCHER, and SCHNEIDER (*Jour. Landw., 52 (1904), p. 97; abs. in Chem. Ztg., 28 (1904), No. 45, Repert. No. 13, pp. 159, 160*).—The beneficial effect of liming on bacterial activity is discussed.

The salt content of soils and its effect on the growth of cereals, V. PEGLION (*Staz. Sper. Agr. Ital., 36 (1903), No. 8–9, pp. 684–694; abs. in Centbl. Agr. Chem., 33 (1904), No. 8, pp. 507, 508*).—The results of examinations of 5 samples of soil with reference to salt and chlorin contents are reported. These show proportions of salt varying from 0.35 to 3.746 per cent, of chlorin from 0.028 to 1.17, the crop on the soil containing the smaller percentages being normal but entirely failing on the soil containing the larger percentages.

Basal examinations of Danish uncultivated moors, A. MENTZ (*Tidsskr. Landbr. Planteavl., 11, pp. 365–375*).—The paper gives a plan of basal examinations of Danish moor soils, according to which work has been in progress in western Jutland since 1901. The apparatus used in the examinations are described and the various phases of the investigation briefly discussed.—F. W. WOLL.

Geological-agronomic soil charts (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 31, p. 204*).—A brief note referring to the geological charts of Prussia and neighboring states recently issued by the Royal Geological Bureau, calling attention especially to the information which they contain regarding chemical composition and other properties of the Prussian coast lands (sand dunes and forest soils).

On the existence of alkaline rocks in Central Africa, L. GENTIL (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 6, pp. 413–415*).—The results of examinations of phonolites and rhyolites from the region of Tchad are briefly reported.

Reclamation of Cape Cod sand dunes, J. M. WESTGATE (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 65, pp. 38, pls. 6*).—A report is given of the extensive expe. ents which have been conducted in attempts to fix the sand dunes which

surround Cape Cod Harbor, and to prevent the shifting of the sands, which would otherwise cause great damage by encroachment on valuable property. The botanical and physiographical features of the region are described and an account given of a natural reclamation as well as the artificial means which have been adopted for binding the Cape sands.

The artificial reclamation work has been carried on by private individuals, the State of Massachusetts, and the General Government for nearly a century. The most satisfactory results have been obtained where beach grass (*Ammophila arenaria*) was utilized, and since 1895 more than 200 acres have been planted to that species. The methods and cost of planting are described and the peculiar efficiency of this grass is pointed out.

In order to permanently reclaim the district forest species will be required, and a number of species of woody plants have already been tested with varying success. The most promising are the pitch, Austrian, and Scotch pines. The black locust and European or black alder are also proving of value, and the Scotch broom, although not entirely hardy, is said to be well adapted to certain situations.

Notes are given on the ownership of the lands and their value, and the report concludes with a brief bibliography of the literature relating to the subject.

FERTILIZERS.

Manures, T. S. Dymond and F. Hughes (*Essex Education Com., Notes Agr. Anal. County Tech. Labs., 1904, pp. 15–22, 34–39*).—Analyses of a large number of fertilizing materials are reported and discussed.

Report on experiments with green manures in Pomerania, D. Baessler (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 32, pp. 205–207*).

Cooperative fertilizer experiments in Malmöhus County, Sweden, during 1903, G. Nordin and M. Weibull (*Malmö. Läns Kgl. Hush. Sällsk. Kvart., 1904, No. 1, pp. 143–201*).—The cooperative fertilizer experiments conducted under the auspices of the Malmöhus County Agricultural Society were continued during 1903, 80 different trials being made, viz, 26 with sugar beets, 5 with fodder beets and potatoes, 5 with pastures, and 44 with barley, oats, wheat, and rye. The experiments were conducted on 44 different farms, and were planned to ascertain the economy of different practical systems of fertilization. The report gives detailed information as to the different trials, including character and history of soils, fertilizers applied, data obtained at harvesting time, and the economy of the applications of fertilizers.

The highest returns were obtained from applications of nitrogenous fertilizers only in about one-third of the number of trials, one-third gave the highest returns from nitrogen and phosphoric acid, and nearly one-third from a complete fertilizer. In 96 per cent of the trials fertilization with nitrate was required (as in 1902), in 64 per cent a phosphoric-acid fertilization, and in 36 per cent potash fertilization were required (against 70 and 43 per cent, respectively, in 1902). Potatoes and root crops gave the highest returns for the expenditure of fertilizers, then winter grains, and least spring grains and hay.

Fertilizer experiments with peat litter.—Three trials were conducted with peat litter for the purpose of determining how it may best be supplemented with potash and phosphoric acid. The results obtained during the year in which the fertilizers were applied indicate that only soils in need of nitrogenous fertilizers are benefited by applications of peat litter (1,500 kg. per hectare). Soils that call for applications of phosphoric acid or potash, or both, besides nitrogen, require an addition of superphosphate or potash (or both) in order that the peat may give economical results. At present prices of fertilizers it is not believed that peat litter will prove an economical fertilizer except perhaps on farms located in the vicinity of peat factories.

Residuary effect of artificial fertilizers.—The residuary effect of applications of artificial fertilizers in 1902 on meadow grass was studied in one trial. While the fertilizers applied paid well the first year, the yields and net profits obtained in the case of the different plats in 1903 were still greater, and in the same direction for each plat as in 1902, the highest results being obtained on the plat receiving 1,000 kg. of Thomas phosphate and 100 kg. of 37 per cent potash salt per hectare.

On the effect of fertilizers on the quality of root crops.—The experiments conducted with root crops during two years indicate that the quality of both potatoes and fodder beets is much more easily influenced by artificial fertilizers than that of sugar beets. It is therefore important to develop varieties of other root crops containing a high percentage of dry substance which are not appreciably affected by the fertilizers applied, as has been done to a large extent in the case of sugar beets under the encouragement of sugar factories.

Soil analyses and their practical value.—A large number of samples of the soils used on the experiments were subjected to chemical, mechanical, and petrographical analyses, and the results thus obtained are discussed in detail by the author in view of recent investigations on the subject of soil analysis. The following average results were obtained for the various kinds of soils examined, the number of samples included in the analyses for 1902 being 34 and, for 1903, 43.

Summary results of analyses of Swedish cultivated soils.

	Silt.	Alumina.		Kaolin.	Total iron.	Humus.	Nitrogen.	Phosphoric acid.	Potash.
		Total.	Kaolin.						
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Stiff clay soils:									
1902	63.6	9.76	....	....	4.22	9.90	0.39	0.10	0.33
1903	64.3	7.49	3.83	9.6	6.72	9.14	.27	.09	.27
Medium clay soils:									
1902	50.1	6.13	....	....	4.57	7.16	.29	.09	.19
1903	50.0	5.80	3.55	8.8	5.27	5.80	.23	.07	.18
Light clay soils:									
1902	34.1	3.99	....	....	2.92	5.07	.20	.09	.15
1903	37.6	3.83	2.48	6.2	3.66	4.82	.10	.07	.14
Clayey sandy soils:									
1902	24.8	1.86	....	....	2.43	5.72	.26	.08	.12
1903	26.8	1.96	1.01	2.5	2.96	4.51	.17	.05	.11
Sandy soils:									
1902	14.2	.54	....	......	2.01	3.56	.15	.09	.10
1903	22.9	.81	.28	.7	2.52	5.56	.18	.09	.08

The practical value of soil analyses is discussed on the basis of the results obtained. The determinations of nitrogen and phosphoric acid are shown to be of no particular value for the class of soils examined, since practically all the soils responded to applications of these fertilizing materials. As to the potash requirements of these soils the author concludes that soils have different requirements according to their physical character.

The following average figures were found for the potash contents of the soils examined: Stiff clay 0.25 per cent, medium clay 0.20, light clay 0.15, and sandy soils 0.10 per cent. A deficiency of potash may be determined by comparing the percentage found with these figures. The crop to be grown and the weather conditions are, however, important factors in determining whether a soil will respond to an application of potash.

On the lime content of Skåne soils.—Most of the soils analyzed were examined for their content of lime as carbonate, assimilable lime (obtained by digestion with a 10 per cent ammonium-chlorid solution on a steam bath for 3 hours), and lime soluble in cold dilute hydrochloric acid. Without discussing the results obtained, which are not considered sufficiently numerous by the author to permit of definite, final conclusions being drawn, the following summary table is reproduced showing the average lime content in Skåne soils of different physical characteristics:

Lime content of Skåne soils.

	Number of analyses.	Lime.		Soluble in hydrochloric acid.
		Carbonate.	Assimilable.	
		Per cent.	*Per cent.*	*Per cent.*
Stiff clay	6	0.01	0.37	0.45
Medium clay	8	.01	.38	.64
Light clay low in lime	40	.06	.34	.51
Light clay high in lime	8	.66	.88	1.61
Sandy soils low in lime	21	.06	.27	.28
Sandy soils high in lime	10	1.15	.47	1.77

The stiff clays are considered sufficiently rich in lime for crop-growing purposes, but their mechanical condition will be improved by liming. The sandy and gravelly soils in the northern part of the county, which have been derived from moraines lying on top of the primitive rocks, Keuper, or carboniferous formations, need lime applications, while the light clays (moraine clay) in general contain sufficient lime for crop production.—F. W. WOLL.

Cooperative fertilizer experiments in Denmark, E. VON SYDOW (*Malmö. Läns Kgl. Hush. Sällsk. Kvart., 1904, No. 1, pp. 202–207*).—A general discussion of the plan and organization of the experiments.—F. W. WOLL.

Increasing the yield by high phosphoric-acid manuring, P. WAGNER (*Ztschr. Landw. Kammer Schlesien, 8 (1904), p. 64; abs. in Centbl. Agr. Chem., 33 (1904), No. 7, pp. 437–439*).—Plat experiments are reported which show that the effect of Thomas slag was felt on grass lands 9 years after its application. Other experiments with oats, rye, clover, beets, peas, etc., extending over 12 years showed that continuous medium applications of slag were continuously beneficial. The slag, however, should be used with caution. The poorer the soil in calcium carbonate, iron, and alumina the smaller the application of phosphoric acid required, and vice versa. The author states also that the richer soils are in phosphoric acid the smaller the applications of nitrogen required.

Report on experiments in pots in 1902 on the value of the accessory constituents of artificial manures, J. W. PATERSON (*West of Scotland Agr. Col. Bul. 20, pp. 19–31*).—Experiments on oats with ammonium sulphate, superphosphate, and kainit are reported. These were compared with pure salts—phosphates of ammonium and potash; sulphates of calcium, sodium, potassium, and magnesium; and chlorids of sodium, potassium, and magnesium. The following conclusions are drawn from the results:

"Nitrogen, phosphates, and potash are the important constituents of artificial manures. In supplying these a limited amount of sulphuric acid as sulphate is desirable in order to obtain a full return. Such sulphate tends to increase the grain as distinct from the straw of oats. The sulphate in a commercial mixture should not be overdone, however, to the exclusion of chlorids (muriates). In giving a complete manure, the choice in regard to the best form of potash should be decided by whether the nitrogenous and phosphatic manures contain sulphate. If they do not, muriate of potash should not be chosen. If they do, sulphate of potash should be neglected for some of the other forms of potash."

Complete humus fertilizers, J. DUMONT (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 23, pp. 1429–1431*).—An account is given of experiments with a humus fertilizer prepared by treating a black humus soil containing 2 per cent of nitrogen with a concentrated potash solution in which aluminum phosphate had been dissolved. The dried product contained soluble matter (humates) 50.4 per cent, nitrogen 1.6 per cent (0.98 per cent soluble), phosphoric acid 2.9 per cent (1.34 per cent soluble), potash 5.5 per cent (all soluble).

The phosphoric acid was apparently combined with the humus in form of phosphohumate compounds, and was quite completely precipitated along with the humus by addition of citric and hydrochloric acids, ferric chlorid, aluminum sulphate, and calcium chlorid, especially the last which removed practically all phosphoric acid from solution.

The humus fertilizer was tested in amounts varying from 400 to 1,000 kg. per hectare (350 to 880 lbs. per acre) with good results on alfalfa, sugar beets, potatoes, and wheat. With alfalfa the results with the fertilizer were better than with chemical fertilizers. The sugar content of the beets was 3 per cent higher where the humus fertilizer was used than where no fertilizer was applied. Tests made on calcareous clay soil showed that the soluble nitrogen of the humus fertilizer nitrified as rapidly as that of blood.

Further experiments with ammonium sulphate and sodium nitrate, Bachmann (*Fühling's Landw. Ztg., 53 (1904), Nos. 13, pp. 502–506; 14, pp. 539–543*).—A number of field experiments with rye, oats, barley, etc., grown on sandy soils are reported to show that ammonium sulphate not only gave larger total yields, but also larger amounts of protein than sodium nitrate.

The use of fertilizers; a review of the results of experiments with nitrate of soda, E. B. Voorhees (*New Jersey Stas. Bul. 172, pp. 32*).—The general principles underlying the use of fertilizers and the conditions under which the use of nitrate of soda is to be especially commended are discussed, and the results of experiments with nitrate of soda on high value market-garden crops and on low value field crops, reported in previous bulletins (E. S. R., 14, p. 247; 15, pp. 242, 251), are reviewed, with practical suggestions as to methods of using nitrate of soda on different kinds of crops.

Investigations on the action of different forms of lime and magnesia, D. Meyer (*Fühling's Landw. Ztg., 53 (1904), No. 14, pp. 528–534*).—A general discussion.

Basic superphosphate, G. Appiani (*Ric. Lab. Chim. Agr. R. Scuola Sup. Agr., Milan, 2 (1903), pp. 131–133*).—Studies of the chemical composition and solubility in citric acid of basic superphosphates made from Tennessee and Gafsa phosphates by the Hughes process (E. S. R., 14, p. 343) are briefly reported.

Commercial fertilizers, J. L. Hills, C H. Jones, and F. M. Hollister (*Vermont Sta. Bul. 108, pp. 297–364*).—This bulletin reports the results of analyses of 118 brands of fertilizers, representing the output of 10 companies, with a discussion of the quantity and quality of plant food furnished in the different fertilizers, selling prices and valuations, classification of brands sold in the State, and comparison of the composition of fertilizers sold in Vermont during 5 years past. The effect of food, care of animals, stable construction and management, and use of absorbents, etc., on the character of farm manures; as well as the causes and prevention of manurial waste, are also discussed with suggestions as to use and application of manures.

Commercial fertilizers, G. Roberts (*California Sta. Bul. 157, pp. 30*).—This bulletin gives the text of the State fertilizer law, approved March 20, 1903; the rules and regulations adopted under its provisions; explanations of terms used in fertilizer analyses; and analyses and valuations of a large number of samples of fertilizers examined in accordance with the law.

Commercial fertilizers, J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 92, pp. 64*).—This is a report on fertilizer inspection during the period from May 1 to December 31, 1903.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1904, No. 23, pp. 48*).—The results of analyses of fertilizers inspected from August, 1903, to January, 1904, inclusive, are reported.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et

AL. (*Maryland Agr. Col. Quart., 1904, No. 25, pp. 54*).—The results of analyses of 460 samples of fertilizers examined from March to June, 1904, are reported, with notes on valuation.

Fertilizer analyses, fall season, 1903, to spring season, 1904, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 6, pp. 1–65*).—The names and guaranteed composition of fertilizers registered for 1904, and analyses and valuations of 595 samples of commercial fertilizers, 84 samples of cotton-seed meal, examined during the fall of 1903 and spring of 1904, with explanations regarding terms used in fertilizer analyses, freight rates, valuation, etc.

Fertilizer analyses, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 7, pp. 66*).—Analyses of fertilizers and of cotton-seed meal examined during the fall and spring seasons, 1902–03, with a list of brands of fertilizers registered for 1903.

Naturally occurring fertilizers and waste products, F. T. SHUTT (*Canada Expt. Farms Rpts. 1903, pp. 148–152*).—This article discusses the nature and treatment of swamp muck, the fertilizing value of tobacco and potato starch factory refuse.

FIELD CROPS.

Field experiments with farm crops, W. SAUNDERS, J. H. GRISDALE, W. T. MACOUN, F. T. SHUTT, J. FLETCHER, C. E. SAUNDERS, R. ROBERTSON, S. A. BEDFORD, A. MACKAY, and T. A. SHARPE (*Canada Expt. Farms Rpts. 1903, pp. 5–46, 49–55, 79–87, 111–114, 132–134, 144–148, 212–215, 217–238, 264–284, 310–333, 355–375, 397–412*).—The work with field crops at the Canada Experimental Farms in 1903, which is in continuation of previous experiments (E. S. R., 15, p. 135), is reported. The results of variety tests with most of the crops mentioned have been noted from a previous publication (E. S. R., 15, p. 861).

Wheat.—The work with wheat at Ottawa, including breeding new varieties, milling tests, chemical analyses, and fertilizer experiments is reviewed. The breeding of new varieties has been noted from another source (E. S. R., 15, p. 352). Milling tests were made of samples of the crossbred varieties Preston, Stanley, and Percy, from Ottawa and Indian Head, and compared with samples of Red Fife from the same sources. All are considered good milling wheats, but the 2 samples of Red Fife and the sample of Stanley from Ottawa are regarded as best. According to the report of an English expert, samples of Percy and Stanley from Indian Head were equal to Red Fife as regards color, strength, appearance, and milling structure. The analyses of the same class of samples are given in the following table:

Analyses of wheats.

Variety.	Locality where grown.	Weight per bushel.	Weight of 100 kernels.	Moisture.	Albuminoids.	Fat.	Crude fiber.	Ash.	Carbohydrates.	Gluten.	
										Wet.	Dry.
		Lbs.	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Percy	Indian Head	62	2.828	11.50	12.50	2.26	1.79	1.47	70.48	38.10	14.78
Preston	do	63½	3.022	11.48	11.63	2.25	1.85	1.68	71.11	31.68	12.34
Red Fife	do	62½	3.164	11.44	12.44	2.48	1.86	1.36	70.42	34.68	13.43
Stanley	do	62¼	3.019	11.08	12.41	2.42	1.88	1.44	70.77	37.48	14.18
Percy	Ottawa	62	3.551	12.05	13.56	2.14	2.09	1.91	68.25	41.59	16.64
Preston	do	63	3.680	12.22	12.22	2.46	1.83	1.88	69.39	35.93	14.26
Red Fife	do	61	3.302	12.79	12.41	2.43	2.02	1.84	68.51	34.35	13.55
Stanley	do	62	3.551	12.23	12.34	2.44	2.08	1.71	69.20	33.95	14.22

Further milling tests and analyses reported show that samples of White Fife and Early Riga from Ottawa were of excellent quality, and that samples of Goose from Ottawa and Indian Head were very poor for milling and bread making. The parentage and characters of Preston, Stanley, Huron, Percy, and Laurel are noted.

The records for several years show that Harold, Gehun, Early Riga, Fraser, and Ebert, the earliest varieties now grown at Ottawa, are about 2 weeks earlier than Red

Fife, and about 1 week earlier than Preston. Of a dozen varieties of macaroni wheat Yellow Gharnovka, Gharnovka, and Beloturka, yielding 33 bu. 40 lbs., 31 bu. 20 lbs., and 31 bu. 20 lbs., respectively, proved most productive. Sixteen varieties of winter wheat sown September 6 and harvested from July 18 to 25, varied in yield from 29.25 to 45.25 bu. per acre. The leading varieties were Turkey Red and Dawson Golden Chaff, all others producing less than 40 bu. per acre.

At Brandon, seed from large heads of 26 varieties yielded on an average 30 bu. 10 lbs. per acre, against 29 bu. 50 lbs., from unselected seed. Seven varieties grown on summer fallow on plats from 2 to 5 acres in size, yielded from 26 bu. 50 lbs. to 41 bu. 20 lbs. per acre, with White Connell as the leading variety. A comparison of a shoe and a disk drill for sowing wheat showed no material difference in yield. Four different methods of bluestone and formalin treatment to prevent wheat smut proved effective.

In addition to the regular plat experiments 9 varieties of spring wheat were grown in field lots at Indian Head, and of these Huron gave the largest yield, 40 bu. 24 lbs. per acre. The average yield per acre for all varieties was 35 bu. 48 lbs. Notes on summer fallowing and breaking up and cultivating new prairie lands are given.

At Agassiz, Oregon Club and Blue Stem, sown September 22 and April 25, yielded, respectively, 49 bu. 20 lbs. and 46 bu. 40 lbs. per acre for the fall sowing, and 37 bu. 20 lbs. and 38 bu. 40 lbs. for the spring sowing.

Spelt, emmer, and einkorn.—Descriptions of these crops are given and the yields and characters of the different varieties recorded. At Ottawa the yields of 11 varieties of spelt and emmer ranged from 1,020 to 2,660 lbs. per acre, and in a single test einkorn yielded 2,720 lbs. per acre. Red spelt and Smooth spelt were the leading varieties among the spelts, and Long emmer, with a yield of 1,760 lbs. per acre, was the leading emmer.

At Nappan, White spelt, White Bearded spelt, Common emmer, and White emmer yielded 29⅓, 28⅗, 25⅓, and 23⅓ bu. per acre, respectively. The 2 spelts weighed, respectively, 35 and 34 lbs. per measured bushel. White emmer at Brandon yielded 43 bu. 50 lbs., Red emmer 38 bu. 40 lbs., Smooth spelt 29 bu. 20 lbs., and White Bearded spelt 27 bu. per acre. The emmers weighed 47½ and 39 lbs. per measured bushel, respectively, while the spelts weighed only 26 lbs.

Red Fife wheat, Banner oats, and Mensury barley were grown after spelt or emmer, summer fallow, and wheat, and in each case the highest yields were obtained where the crops followed spelt or emmer, and the lowest where they followed wheat. At Indian Head Common emmer and Red emmer yielded 54⅗ and 42½ bu., and White spelt and Black Bearded spelt 39⅗ and 26⅓ bu., respectively. The yield per acre of 6 varieties of spelt and emmer at Agassiz was as follows: Common emmer 2,190, South Dakota No. 3 2,130, South Dakota No. 524 2,040, Red Spelt 1,960, Thick emmer 1,920, and White Bearded spelt 1,720 lbs. The yields of straw per acre from these varieties ranged from 4,600 to 4,120 lbs. The period of growth of these crops at the different farms varied from 114 to 143 days.

Oats.—The culture tests with oats are reviewed and the results with some of the best varieties noted. The following analysis of Banner oats grown at Ottawa in 1902, is reported:

Composition of the whole grain, kernels, and hulls of Banner oats.

	Proportion to whole grain.	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Oats (whole grain)	....	12.74	11.22	4.82	58.84	9.47	2.91
Kernels	71.92	12.03	14.51	6.21	63.15	1.93	2.14
Hulls	28.08	10.19	2.60	.78	49.63	31.63	5.17

The experience at Ottawa has been that the earliest varieties, and notably Wallace, Welcome, and White Wonder, are low in yield. At Brandon Abundance, Waverly, Banner, Tartar King, and Improved Ligowo drilled on summer-fallowed plats of clay loam soil, from 3 to 7 acres in size, yielded 86 bu. 18 lbs., 86 bu. 5 lbs., 83 bu. 15 lbs., 82 bu. 30 lbs., and 73 bu. 18 lbs., respectively.

Banner oats after flax, millet, summer fallow, and turnips produced, respectively, 117 bu. 12 lbs., 115 bu., 102 bu. 32 lbs., and 85 bu. 10 lbs. per acre. On field plats at Indian Head, Banner and Abundance among 9 varieties led in productiveness, with 119 bu. 2 lbs. and 106 bu. per acre; required 122 and 124 days to mature, and weighed 38 and 39 lbs. per measured bushel, respectively. The average yield per acre of the 9 varieties was 95 bu. 8 lbs.

Barley.—The earliest varieties of 6-rowed barley grown at Ottawa for 5 years or more, are Odessa, Stella, and Trooper, being about 1 day earlier than Blue Long Head and Mensury. Of the 2-rowed varieties Jarvis, Beaver, and Gordon, all crossbred sorts produced at Ottawa, were the earliest. Canadian Thorpe and French Chevalier ripened 2 or 3 days later. At Brandon, Mensury 6-rowed produced the best yield when grown after millet, as compared with following summer fallow, flax, and turnips, mentioned in the decreasing order of yield. An average yield of 56 bu. 25 lbs. per acre was obtained from four 2-rowed and five 6-rowed varieties grown on field plats of fallow and brome grass sod.

Rye.—Spring rye sown April 17 required 115 days to mature at Ottawa, and yielded in bushels of 56 lbs. 21 bu. 24 lbs. per acre. A yield of 38. bu. of grain and 4,540 lbs. of straw per acre was obtained at Indian Head. Fall rye at Indian Head sown October 7 ripened August 20 and yielded 46 bu. 20 lbs. per acre.

Corn.—Champion White Pearl, Selected Leaming, and Longfellow were grown at Ottawa, as in previous years, in rows 21, 28, 35, and 42 in. apart, and in each case the yield favored the closest planting. The results have varied in different years, but this is believed to be due to the character of the season. At Nappan the results of an experiment on the same plan were generally in favor of the wider rows.

At Brandon, the yield in every instance was again highest with the closest planting. The average yield of green corn at Brandon from rows 30 and 36 in. apart was about the same, while the rows 42 in. apart produced over 5 tons less per acre. Early Amber Rice and White Pearl pop corn failed to mature grain at this farm, but yielded 14.80 and 18 tons of green fodder per acre, respectively. The distance tests at Indian Head resulted in favor of the 21-in. rows with Longfellow and Champion White Pearl, and in favor of the 28-in. rows with Selected Leaming. At Agassiz, where the varieties were grown in hills and drills at the different distances, the results indicated that drilling in rows 3 ft. apart was likely to be most generally satisfactory.

Peas.—The earliest varieties at Ottawa were Chancellor and White Wonder, which ripened about 2 days before Paragon and Arthur, 2 crossbred varieties produced at the experimental farms. Chancellor, with a period of growth of 118 days, yielded 30 bu. 20 lbs. per acre, while White Wonder produced only 22 bu. 40 lbs.

Potatoes.—Of 15 varieties tested at Ottawa in 1903, in addition to the regular tests on uniform plats, 9 gave yields of over 300 bu. per acre. Morgan Seedling and Vermont Gold Coin, the 2 leaders in this test, produced at the rate of a little over 522 and 477 bu. per acre, respectively. At Brandon, in similar experiments, Peachblow and Chenango ranked first, with 539 and 446.6 bu. per acre, respectively. Digging 17 early varieties on August 8 and 20, and September 4, at Nappan, showed that the average yield of marketable tubers increased from 157 bu. 56 lbs., the yield obtained August 8, to 241 bu. 56 lbs. by August 20. After this date there was no further gain in yield.

Tests at this farm with tubers cut in different ways for planting were in favor of sets made by cutting the tuber in two, lengthwise. Medium-sized whole tubers gave nearly as good results. A plat planted with sets treated with air-slaked lime

gave a somewhat better yield than the check plat. In a fertilizer test at Agassiz, 100, 150, and 200 lbs. of Thomas slag increased the yield, respectively, over the untreated plat by 88.6, 92.7, and 102.4 bu. per acre.

Flax.—At Ottawa, Riga flax yielded at the rate of 22 bu. and White Russian at the rate of 24 bu. per acre. Seven varieties compared at Brandon were sown June 2 and harvested from August 25 to September 1. Navarossick, the leading variety, yielded 26 bu. 44 lbs. of seed per acre; followed by La Plata, with 20 bu. 40 lbs. Bombay yielded only 8 bu. 32 lbs. per acre. Sowing 60 lbs. of seed per acre gave a better yield than either thicker or thinner sowing. Improved Russian and Early Riga, sown at Agassiz May 7, ripened August 10, and yielded, respectively, 14 bu. 23 lbs. and 12 bu. 8 lbs. of seed per acre.

Buckwheat.—A test of 5 varieties made at Nappan resulted in favor of Silver Hull, yielding 45 bu. 40 lbs. per acre, with Rye buckwheat, yielding an even 45 bu., ranking second. On 4½ acres of new land Silver Hull produced 23 bu. 16 lbs. per acre.

Root crops.—Analyses of mangels, carrots, and turnips show that Giant Sugar Feeding, Half Long Sugar White, and Half Long Sugar Rosy, varieties known as sugar mangels, led in sugar content with, respectively, 10.40, 9.82, and 9.61 per cent of sugar in the juice. Gate Post and Giant Yellow Globe mangels have been compared for 4 years, but the changes due to season did not disturb the relative position of the 2 varieties with reference to the percentage of dry matter and sugar, Gate Post being the leader. Results with sugar beets at the different experimental farms and other points are also briefly noted.

The results of experiments at Ottawa in sowing root crops on May 7 and 21 and harvesting on October 19 and November 2 show that turnips and sugar beets produced the largest yields from the early sowing and early harvesting, and mangels and carrots from the early sowing and late harvesting. Owing to the season the results with root crops did not harmonize with those of previous years. At Nappan 5 varieties of turnips were sown on acre plats and fertilized at the rate of 250 and 500 lbs. of complete commercial fertilizer after a general dressing of barnyard manure had been given. In each case the heavier application gave the largest yield, but the difference in its favor was not very large. An experiment with mangels on the same plan gave similar results.

Grasses and other forage crops.—Soy beans and horse beans at Ottawa gave better yields in 28-in. rows than in 21-in. rows. At Nappan and Indian Head better yields were obtained from 21-in. rows than from 28 or 35 in. rows, while at Agassiz the results were in favor of the rows 28 in. apart. The leading varieties of millet at Ottawa were Pearl and Algerian, yielding 8.08 and 6.4 tons of green fodder and 3.92 and 4.6 tons of hay per acre, respectively. At Brandon the best yields were in favor of Algerian and Moha Hungarian millets, while at Indian Head Hungarian and White Round French stood first, with a yield of 6 tons each. At Agassiz White Round Extra French and Red Orenburg were the leading varieties, yielding 3 tons and 1,920 lbs. and 3 tons 960 lbs. per acre, respectively. Canary grass (*Phalaris canariensis*) required 131 days to mature at Indian Head and produced 29 bu. 20 lbs. of seed and 3,960 lbs. of straw per acre. The yields of brome grass (*Bromus inermis*), Western rye grass (*Agropyrum tenerum*), alfalfa, and timothy at this farm are also recorded.

In 1900 a series of plats were sown with grain and the alternate plats were sown at the same time with clover at the rate of 12 lbs. per acre. This crop of clover was plowed under and the increase in yield of wheat, oats, barley, corn, potatoes, mangels, turnips, sugar beets, and carrots for the next 3 years was observed. In every case the use of clover showed an increase in yield.

At Ottawa, among 5 different grass mixtures grown for hay, 10 lbs. of timothy and 8 lbs. of common red clover per acre gave the best results. In a similar experiment at the same place a mixture consisting of 5 lbs. of timothy, 4 lbs. of Awnless brome

grass, 2 lbs. of orchard grass, 6 lbs. of alfalfa, and 3 lbs. of alsike clover gave a total annual yield of 4.38 tons per acre, being the highest yield for all mixtures. In 1902 this mixture stood second. For the dry districts of the West a mixture of 12 to 15 lbs. of alfalfa and 6 lbs. of brome grass is recommended.

Good yields have also been obtained throughout the country from ½ bu. each of tares and oats, peas and oats in the same proportion, and 1 bu. each of peas, wheat, and oats; or of peas, wheat, and late barley. Notes on the culture of sainfoin are given in this connection. At Brandon Mammoth Red clover yielded 2.35 tons of hay per acre, as compared with 1.8 tons for common red clover and 0.9 of a ton for alsike clover. Two cuttings of alfalfa in this series of tests yielded a total of 3.75 tons of hay per acre.

Miscellaneous.—The conclusions drawn from fertilizer experiments with wheat, barley, and oats, in progress since 1888, have been previously reported (E. S. R., 14, p. 130). A series of experiments with different fertilizers in different combinations, including superphosphate of lime and Thomas slag, has heretofore been described (E. S. R., 15, p. 135). This season the best yield, 20 bu. of wheat per acre, was obtained from the plats receiving 800 lbs. of Thomas slag alone, 400 lbs. of Thomas slag with 200 lbs. of kainit, and 400 lbs. of Thomas slag, 200 lbs. of kainit, and 100 lbs. of nitrate of soda per acre.

The yield of oats was in favor of an application of 1,000 lbs. of fresh slaked lime per acre, being followed by applications of 100 and 200 lbs. of nitrate of soda. The highest yields of brome-grass hay were obtained on the plats receiving 400 lbs. of superphosphate of lime and of Thomas slag, each applied alone. The yields amounted to 3.8 and 2.8 tons per acre, respectively. In this series of tests the highest yield of corn fodder, 3.16 tons per acre, was obtained from the use of 12 tons of fresh barnyard manure per acre.

The cost of producing a bushel of oats at Ottawa, disregarding the value of the straw, is estimated at 21.7 cts., and the cost of producing a ton of hay at $3.93. It cost $1.64 to produce 1 ton of corn silage in the silo, and $21.73 to put the yield of an acre of corn, 13.25 tons, into the silo.

The yields of different grain mixtures are reported without comment.

Waverly oats sown in drills 7 and 14 in. apart did not show a difference in quality, but the yield in grain and straw was slightly in favor of the wider drills. Canadian Thorpe barley sown in the same way gave a noticeably better quality of grain from the drills sown 7 in. apart, while the weight of straw and grain produced was largest from the wider drills. Two lots of well-cured new hay in the mow lost 4.3 per cent in 113 days in one case and 5.1 per cent in 144 days in the other.

The yields for 3 years of wheat, oats, and barley from different qualities of seed are shown in a table, but no conclusions are presented. The results of a fertilizer experiment with corn show that an application per acre of 500 lbs. of complete fertilizer, in addition to a dressing of barnyard manure, gave an increase in the yield of 4 varieties of corn of about 3 to 5 tons per acre, while an application of 250 lbs. gave an increase of about 1.5 to 3.5 tons.

The results of a series of rotation tests in progress at several farms are given in tables.

Report of the Upper Peninsula Substation for the year 1903 [Field corps], L. M. Geismar (*Michigan Sta. Spec. Bul. 28, pp. 3–19*).—An account is given of the weather conditions at the station during the year and of the growth at the station of a number of cereals, forage, and root crops. The season was characterized by an excess of rain and late spring and early fall frost. The yield of oats ranged from 13 to 21 bu. per acre, the latter being given by the variety Black Beauty. The best yield of spring wheat was obtained from Velvet Chaff, 13½ bu. per acre. Of 8 varieties of barley tested, Bonanza led with a yield of 35 bu. of grain per acre. Silver

King yielded 34 bu. per acre, and Beardless 30 bu. Spring rye yielded at the rate of 35 bu. per acre.

Owing to the excessive wet weather field peas grew largely to vines. Many of the peas shelled out before they could be properly cured. Golden Vine produced the heaviest yield of vines, 5,060 lbs. This variety, which it was claimed would attain an average length of 3½ ft., actually reached an average length of 9½ ft. at the station. Several varieties of corn were tested, but none matured. Flax yielded at the rate of 16 bu. of seed per acre. Hungarian millet and alsike clover produced the largest yield of forage per acre, each yielding over 8,000 lbs. An instance is cited in which a luxuriant growth of sand vetch apparently smothered out quack grass. The New Era cowpea reached a height of 16 in. before being killed by frost.

Of soy beans tested Ito San, Medium Early Black, and Ogemaw made the best showing. These blossomed and produced pods, but none of the seed ripened. Dwarf Essex rape and Thousand Headed kale were very successful at the station. The rape produced seed at the rate of 760 lbs. per acre. Of 20 varieties of potatoes tested, Sir Walter Raleigh led in yield. Experiments were made to determine the relative value of fall and spring planting, of spraying potatoes, and of hilling and level culture. Whole potatoes planted in the fall from 2 to 5 in. deep produced practically as good yields and more marketable potatoes than when the same varieties were planted in the spring. Cut potatoes planted in the fall did not give such good results. Many of the pieces rotted and the sprouts appeared weak.

Spraying potatoes with Bordeaux mixture was without benefit during the season, the unsprayed potatoes giving slightly better yields. Level cultivation resulted in larger yields than hilling. Sugar beets grown at the station gave an average sugar percentage of 16.4 and 86.4 purity. Some figures are given showing the shrinkage in beets shipped from the station to a sugar-beet factory at Menominee and to the agricultural college. The loss varied from nothing to 5½ per cent.

The Woburn pot culture experiments in 1902, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 348–364, figs. 9*).—Previous results in this series of experiments are noted in E. S. R., 14, p. 28.

The Hills experiments.—The action of different compounds of manganese at the rate of 2 cwt. per acre on wheat and barley is reported. The insoluble compounds were mixed with the upper 4 lbs. of soil in the pots before sowing the grain, and the soluble compounds were applied in a water solution the day after sowing. The black oxid of manganese (MnO_2) and the carbonate of manganese caked the surface soil and turned it to a dark-brown color. In the wheat experiments the chlorid and the nitrate produced a good color in the plants, while the iodid distinctly retarded germination and growth.

Excepting the pots receiving manganese nitrate and manganese phosphate, the untreated pots in general produced as good plants as any of the others. Seeds soaked for 15 minutes in a 10 per cent manganese-iodid solution were very much reduced in vitality, while soaking in a 5 per cent solution did comparatively little injury, and soaking in a 1 per cent solution apparently gave an increase in yield. The phosphate, chlorid, sulphate, and red oxid (Mn_3O_4) gave each an increase in yield. The nitrate increased the yield of straw but gave less grain than the untreated pot, and the iodid largely reduced both grain and straw.

In the experiments with barley the black oxid, the carbonate, and the sulphate retarded the coming up of the plants. The carbonate, the sulphate, and the iodid pots gave plants inferior to those grown in untreated soil. Soaking the seed in a 10 per cent manganese-iodid solution was less harmful than with wheat. The yields show that the 2 oxids gave no increase in either grain or straw, but that all other treatment had been beneficial. The iodid in this case produced no injurious effects, and the same result was observed with sodium iodid in 1900. The author states that

the iodids may have been washed down and thus rendered harmless to barley, which is a surface feeder.

Miscellaneous experiments.—Twenty-four grains of a sample of wheat badly affected with smut were soaked in water at a temperature of 50 to 55° C. for 15 minutes and sown and compared with 24 untreated grains from the same source. The plants from the untreated seed produced only 10 sound grains, while those from the treated seed yielded over 900 grains with only about 3 per cent of them affected with smut. This method of treatment also gave good results with barley.

Soil studies are being conducted for the purpose of determining whether lime restores fertility by supplying a necessary constituent to the soil, by neutralizing the acidity, or by its effect upon the physical condition, and further to ascertain the nature of the acidity formed in the soil. The history of the soil under investigation is given, and the observations which suggested this line of work are described.

In studying the effects of lime a series of soil samples were continuously treated with the following solutions, each one used for the treatment of a particular sample: Distilled water, nitrate of soda, sulphate of ammonia, and muriate of ammonia. The leachings were analyzed, and while the work is not completed at present, the observations so far made are summarized. The distilled water passed through the soil slower than any of the solutions and was largely retained. The nitrate of soda solution often retained water on the surface by forming a hard surface crust, while the solutions of sulphate of ammonia and muriate of ammonia also hardened the surface of the sample, but the drying of the soil resulted in large fissures through which the liquid could pass more quickly into the lower portions of the sample than in the other tests.

The distilled water removed comparatively little organic matter from the soil, while the first leachings obtained from the samples treated with the solutions of ammonia salts were deeply colored. The removal of lime, as well as that of magnesia, was smallest with the water and increased with nitrate of soda, sulphate of ammonia, and muriate of ammonia, in the order mentioned. The rate of removal with muriate of ammonia was twice as rapid as with nitrate of soda. Sulphate of ammonia was a less potent factor in removing lime than muriate of ammonia, still more exhaustive than nitrate of soda. The author states that the removal of lime from the soil is most rapid in spring and summer, when nitrification is most active, and that it almost ceases during the winter. This investigation will be continued until the lime is exhausted.

The experiments to determine the nature of the acidity in the soil were begun in November, 1901. Surface soil to the depth of 7 in. was washed with distilled water until it had lost its acid character and was then air dried. A similar sample was exposed to the air for 5 months by being spread out and shoveled over from time to time. In this sample also the acidity practically disappeared through the treatment.

Six plants each of wheat, barley, and oats were grown on these samples and compared with crops produced on ordinary field soil not treated with ammonia salts, on acid soil, and on the same acid soil treated at the rate of 1 ton per acre of calcium chlorid. The object of these tests was to determine whether the injurious effects of soil acidity could be removed by washing, aeration, or neutralization, and whether the different crops were equally affected.

Wheat and barley grew best on the washed soil and oats on the aerated soil. Oats did not seem as sensitive to soil acidity as either wheat or barley. Watering the ordinary field soils with leachings from the acid soil did not give a marked reduction of crop. The results obtained are given in the following table:

Results of wheat, barley, and oats on soil samples of different degrees of acidity.

Soil samples and crops.	Length of straw.	Length of ear	Number of ears.	Number of grains.	Weight of corn.	Weight of straw.
Aerated soil:	*Inches.*	*Inches.*			*Grams.*	*Grams.*
Wheat	22.7	2.93	8	169	5.33	18.19
Barley	13.2	1.91	8	107	4.33	5.55
Oats	14.7	4.20	12	294	10.79	12.99
Washed soil:						
Wheat	16.7	3.44	10	194	7.51	19.54
Barley	16.0	3.00	14	258	10.92	12.24
Oats	11.3	3.94	18	249	8.91	16.18
Ordinary field soil:						
Wheat	25.8	2.66	9	180	6.83	14.48
Barley	12.7	2.50	14	236	10.36	10.85
Oats	18.4	5.10	11	199	8.14	13.52
Acid soil treated with calcium chlorid:						
Wheat	....	....	1	1	.02	.58
Barley	....	....	....	....	....	....
Acid soil: Barley	....	....	1	1	.02	.58

The author believes "that the acidity of the soil brought about by the continual use of ammonia salts, or else the condition of soil consequent on its formation, is the cause of the failure of the land to produce barley and wheat."

In view of the fact that when the acid was removed from the soil it still contained enough lime to produce a healthy crop, the removal of lime from the soil in itself is not considered the cause of failure in crop production. The results further show that the acidity produced by continued use of ammonia salts and the consequent loss of lime from the soil can not be removed by the use of a neutral salt like calcium chlorid, but the author states that this can be accomplished by applications of lime. The acidity seemed to be due, not to soluble mineral acids, but to weak organic acids or to acid salts.

Experiments with crops and stock in the year 1902–3 (*Cambridge* [*England*] *Univ., Dept. Agr., Rpt. Expts. Crops and Stock, 1902–3, pp. 27–79, dgm. 1*).—The work with crops is noted here. Cooperative fertilizer, variety, and rotation tests with hay, root, and cereal crops are reported.

In a series of fertilizer experiments on meadows the greatest increase was obtained from the use of sulphate of ammonia and basic slag, and an application of sulphate of ammonia and muriate of potash produced the second best crop. Sulphate of ammonia gave a larger increase in every instance, but the best results were obtained when it was used in combination with basic slag. The phosphatic and potassic manures were quite effective when used alone, and also produced a considerable increase in yield when used with sulphate of ammonia.

At the university farm 16 varieties of mangels were tested and the chemical composition of the roots determined. Yellow Globe mangels produced the largest crop, but they were deficient in dry matter. Goldfinder and Long Red mangels ranked first in the production of dry matter, and Lion Intermediate, which produced only a moderate yield, stood first in keeping qualities.

Taking all the qualities into consideration, the Golden Globe varieties gave the best results. The analyses reported show a close agreement in the composition of varieties belonging to the same group. The variation in the quantity of dry matter varied in the ordinary mangels from 3 to 3.5 per cent, and this was largely due to differences in the sugar content. The percentage of proteids varied from 0.43 per cent in Crimson Tankard to 0.58 per cent in Goldfinder.

A number of varieties of mangels grown at the Norfolk farms under different soil conditions and fertilizer treatment varied in dry matter from 1.3 to 2.9 per cent.

The results at the different farms show that the best mangel in one district may not be the best in another. The analyses of samples taken from these crops show that on the whole the percentage of sugar is more constant than that of dry matter and that proteids varied more and amids much more than either sugar or dry matter.

In addition to 8 varieties of mangels, 13 varieties of swedes were grown at these farms. The varieties of this crop varied less among themselves than the varieties of mangels. The greatest difference in dry matter between any 2 sorts was 3.2 per cent, and the greatest variation due to soil and cultivation, 1.6 per cent. The percentage of sugar was very constant, ranging from 6.1 to 6.7 per cent. The dry matter of the swedes did not contain so much sugar as that of the mangels.

A comparison in composition of different root crops shows that in general small mangels are richer than large ones, but that there are many exceptions in individual roots, and for this reason it is believed that mangels of both size and quality may be obtained. Seed selection for the improvement of root crops is discussed, and it is pointed out that the percentage of dry matter and its content in sugar and proteids may be increased.

A classification of cultivated barleys is presented. Ten varieties of oats were tested at the university farm and of these Waverly, Giant Eliza, and Thousand Dollar were ripe August 12, the other varieties not ripening until August 20 and 21.

The effect of lodging on the yield of wheat was also studied at this farm, and the results show that very badly lodged grain contained 21 per cent of light kernels and moderately lodged grain 8.8 per cent, as compared with 2.1 per cent from grain which stood up well. A series of rotation experiments conducted for the purpose of showing the effects produced by different manures on crops in rotation are reported from different sections.

Field experiments, F. J. Howell (*Jour. Dept. Agr. Victoria, 2 (1903), No. 4, pp. 298–319*).—Cooperative fertilizer experiments on hay crops were made on 30 different fields. The highest average yield, 3.37 tons per acre, was obtained from an application consisting of 2 cwt. of sulphate of ammonia, 3 cwt. of superphosphate, and 1 cwt. of muriate of potash. This yield was more than double the average yield obtained on the unmanured fields.

The data obtained indicate that phosphoric acid was the most important plant food element to be supplied to these soils. Bone dust as a source of phosphoric acid was not as effective as either superphosphate or Thomas slag. Potash produced an appreciable effect on light, sandy soils, but on stronger soils it did not contribute materially to an increase in yield. Nitrogen in the fertilizer applications gave in general good results, but the author advises that this element be procured for the soils by green manuring with leguminous crops.

The results of fertilizer experiments with potatoes are given in tables and briefly noted. The best yield, 6.46 tons per acre, was obtained from the use of 3 cwt. of superphosphate. The highest increase in yield apparently due to the application of fertilizers, 2.57 tons per acre, was obtained from a complete application consisting of 2 cwt. of nitrate of soda, 3 cwt. of superphosphate, and $\frac{3}{4}$ cwt. of muriate of potash. In the experiments with both potatoes and hay superphosphate appeared as the most effective element.

The data for fertilizer tests with maize grown for fodder indicate that the use of 3 cwt. of superphosphate per acre, increased the yield 2.03 tons, and when 2 cwt. of nitrate of soda were added to the superphosphate the increase was 4.43 tons per acre. With only 1 cwt. of the nitrate in conjunction with the superphosphate the increase was 2.82 tons. The use of potash did not give a marked increase in yield. The results of fertilizer experiments with 11 different forage crops show that the maximum yields in 6 cases were obtained from the use of a complete fertilizer application, but these yields were in general only slightly in excess of those where phosphoric acid and nitrogen only had been given.

Cooperative sugar beet culture tests were made on 156 fields, which gave an average yield of 14½ tons, with about 15 per cent of sugar and a purity of over 81.

The average yields per acre of 14 fields of different forage crops were as follows: Maize 12.83, Amber cane 14.64, Kafir corn 9.67, and Egyptian corn 7.83 tons. In a second test Amber cane, Kafir corn, Egyptian corn, and Planter's Friend yielded from two cuttings 29.30, 28.17, 23.10, and 38.47 tons per acre, as compared with 23.57 tons of maize from one cutting.

Rotation experiments (*Ann. Rpt. West Alabama Agr. Expt. Sta. 1903, pp. 1–7*).—On a series of plats corn and cotton were grown continuously or in rotation with peas and oats. The plats under rotation showed a small increase each year over the other plats. Among 8 varieties of cotton tested Russell Big Boll gave the largest yield, 1,040 lbs. per acre. In a fertilizer test with cotton the plat receiving cotton-seed meal and acid phosphate at the rates of 200 and 240 lbs. per acre, respectively, gave the best returns.

Plant breeding experiments, STEGLICH (*Ber. Tät. Landw. Abt., K. Vers. Stat. Pflanzenkult. Dresden, 1903, pp. 5–9*).—The results with continued inbreeding of rye since 1895 show that the type of head remained constant. Length of stem was also a character transmitted to the progeny, and the short and long stemmed strains were clearly differentiated in the length and compactness of the heads. The short-stemmed strains have the shorter and more compact heads.

The results of crossing experiments indicated that the mother plant exerts the greatest influence on the form of the grain and the male parent on its color. Leutowitz mangel proved much more prepotent than Ovoide des Barres. Characters with reference to the foliage seemed to be independent of the form of the root. Crossing these two types brought forth latent characters of the Leutowitz mangel.

Crossing of cultivated plants, T. JAMIESON (*Agr. Research Assn. Scotland Rpt. 1903, pp. 30–32, pl. 1*).—Two-rowed and 6-rowed barley were sown in alternate rows for the purpose of confirming the principle of self-crossing. Nine intermediate forms are reported to have been obtained, and although the author does not believe the evidence to show that the crossing was general, the intermediate forms are considered as confirming evidence that cereals cross by merely growing side by side. Notes are also given on work with grasses and clovers.

The prospects of cassava starch, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 3, pp. 49–51*).—A brief account of tests on cassava growing, together with analyses of cassava products.

Corn growing, C. P. HARTLEY (*U. S. Dept. Agr., Farmers' Bul. 199, pp. 32, figs. 23*).—This bulletin points out the possibilities of increasing the yield of corn and discusses the different means by which this may be accomplished. In this connection attention is given to improvement in quality of seed, condition of soil, and methods of cultivation. The treatment of corn lands and the culture of the crop is considered in detail.

The preservation of corn, LOIR (*Agr. Prat. Pays Chauds, 4 (1904), No. 19, pp. 65–79, figs. 4*).—This article discusses the preservation of cereal grains in granaries and silos, by means of chemical reagents, and by treatment with sulphurous acid fumes according to the Clayton process.

Field experiments with flax in 1903, KUHNERT (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 14, pp. 97–100*).—These experiments were conducted by the German Agricultural Society for the purpose of determining the influence on the quantity and quality of flax fiber when either phosphoric acid or potash is used alone and ascertaining the losses of fiber which result when the flax is pulled in the ordinary way and when it is cut. Three cooperative tests are compared. Each test comprised 4 plats of 10 ares each.

The first plat received no fertilizer, the second received either 45 kg. or 50 kg. of Thomas slag, the third received 30 kg. of 40 per cent potash salt or 90 kg. of kainit,

and the fourth received the combined applications of the second and third. The potash plats gave the largest average yields of seed and of long fiber. The phosphoric acid plats also showed an increase in yield, but where the 2 fertilizers were applied together the increase was unimportant. The 2 methods of harvesting gave practically equal financial returns.

Flax wax, C. HOFFMEISTER (*Ber. Deut. Chem. Gesell., 36 (1903), No. 6, pp. 1047–1054*).—A study of the composition and properties of this constituent of flax, which, it is believed, has an important influence on the character of the fiber.

Commercial fertilizers for lupines on new land, A. CARLIER (*Ing. Agr. Gembloux, 14 (1904), No. 8, pp. 338–345*).—Yellow lupines were grown on poor pine lands for the purpose of improving the same and bringing them under cultivation. Commercial fertilizers were applied in different quantities and combinations and the results for 1902 and 1903 are given in tables with brief comments.

All potash fertilizers were readily effective in increasing the yield. The natural phosphate given alone remained inactive, but when applied with kainit the yields were about equal to those obtained from the use of basic slag. Inoculation of the soil acted unfavorably in nearly all cases. The best results were obtained where the potassic and phosphatic fertilizers were applied together. Superphosphate proved very detrimental and its use made it impossible to grow lupines on the soil for several years afterwards.

Report of experiments on the effects produced on thirteen different oats, or mixture of oats, by top-dressings of nitrate of soda, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1901, pp. 79–82*).—Seed of each kind of oats was sown on 2 adjacent plats, one of which received a top-dressing of nitrate of soda at the rate of 1 cwt. and the other at the rate of 2 cwt. per acre. On the average the 2 cwt. of nitrate of soda produced an increase of about 150 lbs. of grain and 3 cwt. of straw as compared with the use of 1 cwt. The application of 1 cwt., however, was proportionately much more effective.

In another experiment charlock and runch weeds in the oat crop were sprayed with solutions of nitrate of soda of varying strengths at the rate of 50 gal. per acre. The quantity of nitrate of soda thus applied per acre was 50 lbs. in a 10 per cent solution, 100 lbs. in a 20 per cent solution, 150 lbs. in a 30 per cent solution, and 200 lbs. in a 40 per cent solution. The extra quantities of nitrate of soda applied from 50 to 100 lbs. produced a very profitable increase in yield. The 100 lbs. dressing produced 360 lbs. of grain and 1.5 cwt. of straw more than the 50 lbs. dressing, and the 150 lbs. dressing yielded 760 lbs. of grain and 5.5 cwt. of straw more than the 100 lbs. dressing; but the limit of profitable employ was apparently reached with the 150 lbs. of nitrate per acre. It is pointed out that this increase in yield may also be largely due to checking the growth of the weeds by this treatment, and that the results in general may point to a possible advantage in applying nitrate of soda in solution to crops by spraying rather than in the form of a dry salt.

Report on the results of an experiment showing the effects of air and soil space on the productiveness of oats, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1901, pp. 75–77*).—The author upon noticing that oat plants growing on the outer edges of plats are better developed than those growing in the center, conducted a series of experiments to ascertain the advantage gained by plants having the greater access to air and light. Accordingly, 5 plats of Banner oats were divided each into 3 oblong sections. The middle section of each plat was entirely inclosed by oat plants except at the 2 ends, while the 2 outer sections had not only bare ground at the ends, but were also adjacent to bare space on one of their sides.

The yields of grain and straw were in favor of the outside sections. The effect of light as influenced by the position of the plats is discussed. The results in general are considered as showing the great value to plants of abundant air, light, and ample soil space.

Reports on experiments on the manuring of potatoes in 1900, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1900, pp. 107–143*).—This work is in continuation of experiments previously noted (E. S. R., 12, p. 937), and the different quantities of fertilizers used are there given. The general conclusions of this year's work are that large crops of potatoes can be grown with the use per acre of 20 tons of barnyard manure alone, of 10 tons of manure supplemented with commercial fertilizers, and also by the use of commercial fertilizers alone. The amount of increase from the use of manures and the resulting profits were found to be largely dependent upon the variety, a strong-growing, productive variety being usually the most profitable.

The increase in yield with manures was entirely due to an increase in the size of the tubers. Light dressings of barnyard manure produced much better results than the same quantities employed as heavy dressings. The use of 10 tons per acre, either alone or with commercial fertilizers, was very remunerative. Commercial fertilizers were more effective when used with light dressings of manure than when given with heavy applications.

The best cooking quality and highest nutritive value were obtained in the crop grown with commercial fertilizers alone, the particular application consisting of 6 cwt. of superphosphate, 2 cwt. of sulphate of ammonia, 1 cwt. of nitrate of soda, and 2 cwt. of sulphate of potash per acre. Heavy dressings of barnyard manure alone produced watery tubers, but light dressings were less injurious, and commercial fertilizers applied with the manure had a tendency to counteract its unfavorable influence upon the quality. Considering both quantity and quality, the use of light dressings of barnyard manure, together with suitable applications of commercial fertilizers, is believed to be the best practice.

Potash in commercial fertilizers given with barnyard manure increased the dry matter and starch content of the tuber and the data indicated that about 84 lbs. per acre furnished in 1.5 cwt. of sulphate of potash was the most profitable quantity. With barnyard manure either high-grade sulphate or muriate of potash should be used, and with commercial fertilizers alone the commercially pure sulphate of potash should be employed. In these experiments sulphate of potash gave the finest quality of tubers, while those grown where kainit was used were much inferior in quality. Muriate of potash produced potatoes intermediate in quality between those grown with sulphate of potash and those grown with kainit. The muriate had similar effects on the quantity when only commercial fertilizers were employed, but with barnyard manure it was sometimes as effective, or even more so, than sulphate of potash. Where commercial fertilizers were applied a top dressing of 1 cwt. of nitrate of soda per acre immediately after the first weeding had no injurious effect on the quality.

Report on experiments on the manuring of potatoes in 1901, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1901, pp. 15–34*).—These experiments are in continuation of those noted in the foregoing abstract, and the results obtained this season confirm the conclusions previously stated.

Report on the winter v. spring application of manures to the potato crop, J. W. PATERSON (*West of Scotland Agr. Col. Bul. 24, pp. 73–82*).—The Scottish Triumph potato was grown on 14 plats under different fertilizer treatment and the results obtained indicate that phosphoric acid, whether in the form of superphosphate or basic slag, should be applied in the drill and that special nitrogenous manures should be included in the fertilizer application for potatoes. It was found that kainit gave better results when applied to the plowed land in the previous winter than when used in the spring, and that the time of application was not so important for sulphate of potash and muriate of potash.

Results of the German potato experiment station in 1903 (*Deut. Landw. Presse, 31 (1904), Nos. 14, p. 109; 15, pp. 118, 119*).—The results with 34 varieties

are reported. A number of the best varieties are described and their starch content and starch production given. The variety President Kruger produced the largest yield but was not so rich in starch as Richter Imperator, Gastold, and White Queen, which yielded well and showed a good starch content. Irene, Sas, Apollo, and Bund der Landwirte gave large yields of tubers high in starch. Up-to-date, Ella, and Mohort are recommended as good table varieties.

Potatoes, L. R. Taft and M. L. Dean (*Michigan Sta. Bul. 214, pp. 18–22*).—An account is given of a test of nearly 150 varieties. The early varieties gave good yields of fine quality. The results with the late varieties, owing to the season, were not so satisfactory. About 70 varieties are briefly described and in some instances the yields are reported. The highest yield among the early varieties, 367.64 bu. per acre, is recorded for Irish Cobbler. This variety was followed by Coos Early with a yield of 316.18 bu. per acre. Among the late varieties, Maggie Murphy has for 8 years given an average yield per acre of more than 200 bu.

The use of rye grass in seed mixtures (*Jour. Bd. Agr.* [*London*], *11*, (*1904*), *No. 2, pp. 105, 106*).—A brief account is given of experiments conducted by the Edinburgh and East of Scotland College of Agriculture on the use of rye grass seed in seed mixtures.

It is a common belief that the failure of certain lands to carry grass is to some extent due to the mixture of seed used. That generally employed consists of a very heavy seeding of rye grass with from 7 to 10 lbs. of clover seed. The results of the first year's trial showed that the quantity of rye grass can be advantageously reduced and the clovers flourished better where the rye grass had only been used in moderation or not at all. The results thus far obtained clearly indicate that overseeding with rye grass is an important factor in preventing the growth and development of clover.

The influence of different-colored light on the growth of the sugar beet (*Illus. Landw. Ztg., 24* (*1904*), *No. 24, pp. 268, 269, figs. 3*).—Sugar beets were grown under white, yellow, blue, and red glass and compared with specimens grown in the open. The weight of the leaves and roots was ascertained in the beginning of the experiments, August 1, and again on October 9 and November 13.

Average weight of leaves and roots of sugar beets grown under different-colored light.

Date.	Leaves.				Roots.			
	White light.	Yellow light.	Blue light.	Red light.	White light.	Yellow light.	Blue light.	Red light.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
August 1	371.7	313.3	356.7	556.7	165.2	175.9	171.2	298.5
October 9	441.7	745.0	115.0	408.3	623.3	400.0	322.7	348.3
November 13	360.7	270.0	78.3	186.7	654.0	554.0	313.3	362.0

The sugar content was highest in the beets grown under blue glass, but the general results indicate that the use of light of a certain color can not be of economic importance.

Report on experiments with sugar beet in 1902 and 1903, J. W. Paterson (*West of Scotland Agr. Col. Bul. 21, pp. 36–40*).—Experiments with sugar beets were made in 1902 to test the quality of roots grown in the West of Scotland. The beet crop followed oats and the land was prepared as for turnips. Ten tons of fresh barnyard manure, together with 4 cwt. of superphosphate, 2 cwt. of kainit, and 1 cwt. of sulphate of ammonia were applied and the crop was top-dressed later with 1 cwt. of nitrate of soda per acre. Analyses of the samples from the crop were compared with those of beets grown in Germany, and are considered as showing a favorable comparison. The beets contained 16 per cent of sugar, with a purity of 87.95.

In 1903 one acre of beets was grown with the same fertilizer treatment and method of cultivation. The yield obtained was 13 tons 19 cwt., and the results of analyses confirm those of 1902. It is concluded that the West of Scotland can produce as good beets as other parts where beet growing is a regular industry.

Note on the experimental sugar-cane station at Samalkot, Gódávari District, C. A. BARBER (*Dept. Land Records and Agr., Madras, Vol. II, Bul. 48, pp. 269–272*).—This station has been established for the study of cane diseases and of cane cultivation generally. Experiments are being conducted to determine if by any particular method of planting and cultivation healthful canes may be grown, and to test some of the more economical practices in connection with sugar-cane culture in other countries. Directions are given for the culture of the Red Mauritius cane, one of the new varieties distributed by the station.

Investigation of the culture of tobacco, G. MALYETZ (*Report of the Experiment Tobacco Plantation of the Lokvitz Agricultural Society for the years 1898–1902. Ministry of Agriculture and Imperial Domains*).

Report on experiments on the manuring of turnips in 1900, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1900, pp. 63–87*).—These experiments have been previously described, and earlier results have been noted (E. S. R., 13, p. 243). The conclusions drawn are similar to those reported for 1901, and given in the following abstract.

Report on experiments on the manuring of turnips in 1901, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1901, pp. 55–72*).—The results obtained in previous years have been noted (E. S. R., 13, p. 243). This year the experiments were carried out on 21 farms and the objects of the work were mainly to determine the best method of applying nitrate of soda, and the quantities of kainit and superphosphate most profitably given to the turnip crop. These substances, together with sulphate of ammonia, were applied in different quantities and combinations; and the use of barnyard manure at the rate of 10 tons with 5 cwt. of superphosphate per acre, or at the rate of 20 tons applied alone, was also tried.

The results obtained indicate that where nitrate of soda is the sole source of nitrogen, one-half should be given in the drill and the rest as a top dressing after thinning. When the entire quantity was applied either in the drill or as a top-dressing, the results were much less satisfactory; but of the 2 methods, application in the drill seemed preferable. It was found that sulphate of ammonia as the only source of nitrogen was more effective in some seasons than nitrate of soda. The most profitable returns were obtained where one-half the nitrogen was given in the drills in the form of sulphate of ammonia and the remainder as a top-dressing in the form of nitrate of soda.

The omission of potash from the fertilizer application caused a great reduction in yield. Kainit at the rate of 2 cwt. per acre in the fertilizer application was sufficient to give a large increase. The maximum quantity to be given profitably with other fertilizers is believed to be about 4 cwt. per acre. It was shown that 4 cwt. of superphosphate per acre is frequently sufficient for turnips, and that more than 6 cwt. is not likely to be profitable.

The tests further demonstrated that turnips can be grown with barnyard manure or with commercial fertilizers, but that generally the use of both together is likely to be more satisfactory. The plat receiving 10 tons of manure and 5 cwt. of superphosphate yielded on an average 23 tons 8 cwt. of good turnips per acre. Applications of commercial fertilizers when not well balanced, and heavy applications of barnyard manure alone, had a tendency to reduce the quality and to render the crop more subject to disease. Where barnyard manure was applied with superphosphate the quality was not so much reduced, and the yield was also greater.

Report on the relative effects of superphosphate and basic slag upon the feeding quality of turnips, J. W. PATERSON (*West of Scotland Agr. Col. Bul.*

23, pp. 65–70).—Experiments were carried out in 1901 to determine whether superphosphate or basic slag produced the better quality of turnips, and a repetition of the work was made on 3 farms in 1902. The results of both years indicate that roots manured with basic slag are better for feeding sheep than those grown with superphosphate. The slag crops were the lighter, but the deficiency in yield was more than counterbalanced by the feeding quality.

Nitrogen in wheat grains and their size in dependence on precipitation and temperature, V. A. KHARCHENKO (*Izv. Moscov Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *9* (*1903*), *No. 3, pp. 304–311*).—The author examined 12 varieties of wheat, 7 winter and 5 summer varieties, raised during the 5 years 1898–1902. He found that the winter wheats contained less nitrogen than the summer wheats except during the year 1898, when the winter wheat showed a higher percentage, this exception being accounted for by the fact that in 1898 the winter crops were poor while the summer wheats were good; that the greater the annual precipitation the less the amount of nitrogen in the winter wheat; that there is a direct ratio between the temperature and the percentage content of nitrogen in the winter wheat, i. e., the hotter the summer the greater the nitrogen content, the anomalous year 1898 presenting again an exception.

In general, the author's results are in agreement with those commonly found in agricultural literature and are at variance with the contrary results recently published by B. A. Vlasov.—P. FIREMAN.

Wheat in Canada, W. SAUNDERS (*Canad. Mag., 1904, Apr.; abs. in Science, n. ser., 20* (*1904*), *No. 501, p. 183*).—Wheat from Dunvegan on Peace River, 414 miles north of Winnipeg, weighed 64 lbs. per bushel. Ladago wheat from Fort Simpson, 818 miles north, weighed 62½ lbs. The period of growth varied from 101 to 108 days.

HORTICULTURE.

Report of the South Haven Substation for 1903, T. A. FARRAND (*Michigan Sta. Spec. Bul. 27, pp. 36*).—The work here reported consists largely of the results of tests in continuation of those previously reported (E. S. R., 15, p. 38) of a large number of orchard, small fruits, and nuts grown at the South Haven Substation. A heavy crop was secured during the year of European plums, and good average crops of cherries, apples, and pears. Light crops were obtained of peaches, grapes, quinces, and Japan plums.

With a number of the fruits comparative experiments were made to determine the relative value of dust and liquid sprays for the control of insects and diseases. A thorough test was made of these 2 methods on apples and plums for curculio and brown rot. Generally speaking, the cost of preparing and applying the dry Bordeaux mixture according to station methods was more expensive than liquid Bordeaux. The dry Bordeaux, however, could be applied in about one-third less time, and upon very rolling, hilly locations one horse could do the work of 2 or 3. The liquid spray could be used with or against the wind, while the dust spray could not be used against the wind at all and was most effective when there was little or no wind and the foliage was wet from dew or rain. In no instance did the dust stick as well as the liquid spray.

"Both methods gave excellent results in controlling the codling-moth worms in apples, and dust spraying, using formula No. 1 [lye, sulphur, copper sulphate, and Paris green], proved superior to Bordeaux mixture and arsenite of lime in controlling the curculio in the plum orchard, and seemed to control the brown rot fully as well. Upon very close observation it was found that the fine particles of dust would stick to the waxy bloom of the fruit, while with liquid, unless very heavy with lime, the solution would run off of the plums as though they had been greased. In summing up the results obtained in this season's test, it would not seem advisable to change

from the older method to the new, until the latter has been further tested, improved, and perfected, except upon plums and cherries."

The usual descriptive notes and data on yields are given for 16 varieties of raspberries, 11 of blackberries, 7 of currants, 9 of gooseberries, 19 of grapes, 23 of cherries, 43 of plums, 43 of peaches, 42 of pears, 130 of apples, 9 of crabapples, 5 of quinces, and a number of varieties of chestnuts, filberts, pecans, Japan walnuts, and English walnuts.

A thinning experiment with plums was made to determine whether regular thinning would induce annual crops. In 1902 the fruit of trees of Burbank and Abundance were thinned to stand 2 in. apart, and the results compared the following year with trees which had not been thinned. The trees thinned in 1902 showed no more blooms in 1903 and had no more fruit than the trees which had been left unthinned.

The best results were secured in marketing large fancy plums in 4-basket tomato crates, using the $\frac{1}{3}$-bu. basket for the smaller kinds and the 16-quart crate for the blue Damsons. Peach-leaf curl was again entirely controlled at the stations by the use of copper sulphate solution at the rate of 2 lbs. to 50 gals. of water. In this connection it is stated that it is essential that the first spraying be given before the buds swell. No difference could be observed in the control of the disease whether Bordeaux mixture or copper sulphate solution was used.

In order to determine the effects of heavy rain immediately after applying copper sulphate solution for peach-leaf curl, the trees in one experiment were thoroughly drenched with pure water an hour after the solution was applied. No difference was observable in the amount of leaf curl on trees drenched and on those not drenched. The conclusion is drawn that the action of copper sulphate in destroying the spores of the leaf-curl fungus is almost instantaneous. As a result of tests for a number of varieties of cover crops for orchards, the author states that vetch has proved one of the most valuable plants for cover-crop purposes ever tested at the substation. Clover came next in value.

Report of the Upper Peninsula Substation for the year 1903 [Horticulture] L. M. Geismar and C. D. Smith (*Michigan Sta. Spec. Bul. 28, pp. 20–35*).—The horticultural work of the season consisted for the most part of tests of a number of varieties of carrots, ruta-bagas, turnips, parsnips, beets, peas, beans, sweet corn, squashes, pumpkins, tomatoes, radishes, lettuce, spinach, salsify, kohl-rabi, onions, cabbage, some herbs, and other miscellaneous crops, including strawberries and orchard fruits. Very good yields of strawberries were obtained during the season notwithstanding the occurrence of frosts during the blooming period. Partly grown fruit appeared to be more tender than blossoms. Brief descriptive notes are given of many of the vegetables and fruits grown.

Horticultural work at the Canadian experiment stations, W. T. Macoun, W. S. Blair, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1903, pp. 89–104, 107–111, 114–121, 299–309, 339–351, 375–384, 389–392, 412–427, pls. 5*).—The authors give an outline of the horticultural work they have respectively carried on during the year at the Central Farm and the four substations in Canada. As in preceding years (E. S. R., 15, p. 149), extensive trials of varieties of vegetables, fruits, shrubs, and flowers are reported.

At the Central Farm a shipment of apples in cold storage to Glasgow was made. The shipment consisted of 10 boxes of North Star and 80 boxes of Duchess. The net returns averaged about $1.40 per bbl., which was considered satisfactory. The details of the shipment are recorded at length. Descriptions are given of a number of seedling fruits which growers have sent in to the Central Farm. In order to show the individuality of trees, a table is given showing the production each year for 5 years of individual trees of 4 varieties of apples. Some trees yielded 2 to 4 times as much fruit as others.

Some data are given on the growth of horse beans, soy beans and hairy vetch, when planted at different dates as cover crops in the orchard. All proved satisfactory. Variety tests are reported with sweet corn, tomatoes, peas, cabbage, onions, squashes, beans, parsnips, lettuce, turnips, etc. Sparks Earliana has proved one of the most satisfactory early tomatoes grown. An article by Mr. Macoun on growing vegetables in a cheese-cloth inclosure has been noted from another source (E. S. R., 15, p. 673).

At the experimental station in Nova Scotia Mr. Blair reports Alaska and Station as the two best early peas to grow. Tomatoes at the same station, staked and pruned to one stalk, produced ripe fruit earlier and were less affected with rot than when allowed to run untrained over the ground. The yield of fruit, however, was not so large. Sparks Earliana, Bond Early Minnesota, Early Ruby, and Extra Early Advance were the best of the varieties tested.

Mr. Bedford, of the Manitoba Station, gives descriptions of 15 varieties of cross-bred apples which fruited for the first time at the station during the season. Fall sowing of tree seeds has been found to give very satisfactory results at that station. Bush forms of squashes do better than the running varieties. Extra Early Orange Marrow is the best substitute for a pie pumpkin yet tested.

Descriptions are given of 49 varieties of apples, 21 of pears, and 10 of plums which fruited for the first time at the station in British Columbia.

Experiments with manures and fertilizers on different varieties of asparagus and raspberries, A. T. JORDAN (*New Jersey Stas. Bul. 173, pp. 20*).—The author has summarized the results secured in experiments extending over a number of years at the station in the growing of asparagus and raspberries with commercial fertilizers in comparison with manure. The results secured in individual years have been noted from time to time (E. S. R., 15, p. 152). The work includes a study of the relative value of barnyard manure, a complete commercial fertilizer, the same commercial fertilizer plus bone and potash, and the same commercial fertilizer plus bone, potash, and nitrate of soda. Certain cultural features have also been studied.

The combined results of 6 years' work with asparagus place Palmetto at the head of the list of 8 varieties tested as regards disease resistance, early and total yields, and money returns. Donald Elmira stands second in early and total yields. One-year-old roots have been found fully as satisfactory for transplanting as two-year-old roots.

As regards fertilizers, the largest and cheapest yields have been secured by the use of commercial fertilizers alone. The manured plat stands second in yield, but the cost of production has been greater on the manured plat than on any of the others. The use of complete commercial fertilizer alone has been only about one-third as expensive as the manure, while the total yield has averaged 2 per cent better. The addition of bone and potash or bone, potash, and nitrate of soda to the complete fertilizer has not resulted in increased yields, and while more expensive than complete fertilizer alone has been only about one-half as expensive as manure. As compared with complete fertilizer alone manure had a value of 42¾ cts. per ton as a fertilizer for asparagus. The conclusions of the author relative to asparagus are in part as follows:

"The selection of varieties in planting is very important. Palmetto, a disease-resisting variety, gives a yield exceeding that of the Elmira, second in order, by 32 per cent, in the average of six crops, and by nearly 36 per cent in crop of 1903. The cash value by which Palmetto exceeds any other variety equals $111.01 and $221.88, for the average crop and that of 1903, respectively . . . Manure at $1.50 per ton, 20 tons per acre, is the most expensive method of supplying plant food. The returns per dollar of cost are the lowest of any of the four methods of fertilizing used."

The work with raspberries is summarized for the 3 red varieties tested. Of these, Cuthbert stands at the head as regards average yield, and is considered by far the

best market berry of the three. Marlboro is valuable for earliness; Turner is discarded. The largest yield of early fruit has been obtained by the use of manure, but the largest total yield has been obtained on the plat receiving complete commercial fertilizer plus bone and potash. On the basis of cost, however, each dollar invested in manure has returned $1.60 and $6.90, respectively, in early and total yields, each dollar invested in complete fertilizer has returned $5.94 and $27.15 in early and total yields, respectively; each dollar invested in complete fertilizer plus bone and potash has returned $2.46 and $17.63 in early and total yields, respectively; and each dollar invested in complete commercial fertilizer plus bone, potash, and nitrate of soda has returned $2.31 and $11.51 in early and total yields, respectively.

As with the asparagus, the cheapest fertilizer for raspberries, considering the cost and yield, has been the complete commercial fertilizer. The addition of nitrate of soda at blooming time has been without value for this fruit. The author concludes that manure at $1.50 per ton is the most expensive of the four methods of fertilizing practiced with raspberries, while the total yields and the returns per dollar of cost are the lowest obtained.

German asparagus culture, H. W. HARRIS (*Dept. Com. and Labor, Mo. Consular Rpts. 1904, No. 286, pp. 85, 86, fig. 1*).—An account is given of German methods of growing asparagus in the region of Baden. It appears that the roots are planted 4–5 ft. apart in rows about that same distance apart. Stable manure is used in preference to commercial fertilizers and the ground kept mounded up around each hill 10 to 14 in. high. A fair crop is secured about the fourth year, but the field is at its best from 8 to 12 years after planting.

An old asparagus bed, W. S. CAMPBELL (*Agr. Gaz. New South Wales, 15 (1904), No. 4, pp. 322, 323*).—An asparagus bed in flourishing condition 60 years old is described.

Comparative tests of standard varieties of onions, H. FIELD (*West. Fruit Grower, 15 (1904), No. 9, pp. 18, 19*).—The results are given of tests of a number of varieties of onions grown in Iowa. In some instances 2-year-old seed was used. It was estimated that at 50 cts. a bushel the increased money value from the use of 1-year-old seed rather than 2-year old amounted to $140 per acre in the case of the Red Wethersfield variety. Notes are also given on tests of a number of varieties of cabbages and sweet corn. Dahlias were grown from seed nearly as quickly as from bulbs.

Notes from a seedman's trial grounds, H. FIELD (*West. Fruit Grower, 15 (1904), No. 7, pp. 14, 15*).—The results of tests of varieties of lettuce, table beets, peas, string beans, sweet corn, and a number of miscellaneous farm crops are recorded.

Tomatoes, L. R. TAFT and M. L. DEAN (*Michigan Sta. Bul. 214, pp. 13–17*).—Descriptive and cultural notes are given on 72 varieties of red and 8 varieties of yellow tomatoes grown at the station during the year. Relative to the advantages of staking tomatoes the authors state that tomatoes thus trained can be planted much closer, the fruit is of better quality, and in excessively wet years it is possible to ripen a good crop of fruit, when if planted in the ordinary manner it might not mature at all. Little difference was noted in the time of maturing of tomatoes whether from field-grown seed or from seed started in the greenhouse and the seedlings transplanted to the field.

Further studies in crossing peas, stocks, and beans, E. TSCHERMAK (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 8, pp. 533–638*).—A detailed account of the results secured in crossing experiments with a number of varieties of peas, stocks, and beans, with a discussion of the results obtained, with reference to the Mendelian theory of heredity. Reference to earlier work along the same lines may be found in E. S. R., 13, p. 745.

Forcing with carbonic acid, DEMOUSSY (*Jardin, 18 (1904), No. 418, p. 221*).—The author notes an experiment in which lettuce was grown under 4 bell jars. With

2 of the bell jars a small stream of air was circulated through; in the other 2 bell jars air containing 5 times the usual amount of carbonic acid was forced through. At the end of 24 days the 4 plants in each of the pots in which air only had been admitted weighed 21 and 24 gm., respectively, while the 4 plants in each of the pots to which carbonic acid had been added weighed 50 and 60 gm., respectively. The author believes that carbonic acid may be valuable as an aerial fertilizer for market gardeners in intensive culture.

Edible fungi, C. H. PECK (*New York State Mus. Bul. 75, pp. 27–34, pls. 3*).—Technical descriptions are given of a number of species of edible fungi, together with notes on their distribution, habits, and uses.

The fruit trade with foreign countries (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, 6 (1904), No. 5, pp. 38–40*).—Statistics are given of the imports and exports of fruit for the United States during the years 1903 and 1904. For the fiscal year ended June 30, 1904, the fruit exported from the United States was valued at $20,348,299. The fruit imported during the same period had a value of $18,964,930. Bananas were the largest item of importation, being valued at the ports of the producing countries at $7,000,000 to $8,500,000. Next in importance to bananas in the import fruit trade are lemons, at the value of $3,000,000. Apples and prunes are the fruits most extensively exported. The value of the apples exported in 1903–4 amounted to $8,237,894. The value of prunes was $3,410,497. Together these 2 items make up more than half the value of the fruits exported from the United States. Considerable information is given as to the countries from which the various fruits are imported and to which domestic fruits are sent.

Report of the fruit experiment stations of Ontario, L. WOOLVERTON ET AL. (*Ontario Fruit Expt. Stas. Rpt. 1903, pp. 83, figs. 33*).—In addition to an account of a visit of inspection to the numerous fruit experiment stations established throughout Ontario and reports by a large number of growers on the success which they have obtained with different fruits in their respective localities, original descriptions and illustrations are given of 7 varieties of apples, 4 of grapes, 1 of peaches, 3 of pears, 6 of plums, and 1 of raspberries. An effort is being made to identify all of the varieties of fruits now grown in the Province, and these illustrations and descriptions are contributions to that end. An account of other work along the same line may be found in E. S. R., 15, p. 473.

Apple growing in Tasmania, J. KNIGHT (*Jour. Dept. Agr. Victoria, 2 (1904), No. 8, pp. 744–748*).—An account of the methods of planting, cultivating, and handling apples in Tasmania.

The avocado in Florida; its propagation, cultivation, and marketing, P. H. ROLFS (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 61, pp. 36, pls. 4, figs. 9*).—The author presents a summary of present knowledge of the avocado and indicates lines of improvement. The word avocado is preferred for this fruit, which is also known as alligator pear, aguacate, etc. It is at present grown only to a limited extent in southern Florida. It is being shipped to northern markets as a salad fruit and is gaining in popularity.

Some figures are given showing the great variation in fruit and yields obtained from seedling trees. Of an orchard of 160 trees, 5 years old, 47 trees bore no fruit at all; 41 trees bore from 1 to 12 fruits; 22 bore a crop of more than 12 fruits, 9 of which bore a total of 595 fruits, or slightly over half the crop. Of the 63 trees that have fruited in the orchard only 2 combined good qualities in such a way as to be of special merit.

In order to avoid this great variation in quality of fruit and yield the use of budded and grafted trees is advocated, and these methods of propagating are described. The bulletin contains directions for marketing the fruit and an account of the diseases affecting it. Budding is considered the most desirable way of propagating, and crown working is preferable to top working. Pear and oblong shaped fruits are most desir-

able with the color preferences as follows: Yellow, scarlet, green, brown. Fruit which ripens during December or later brings the highest prices.

Improving fruits by bud selection, A. T. JORDAN (*Amer. Agr., 74 (1904), No. 9, p. 160*).—A large number of instances are cited to show the variation in productiveness, earliness, and quality of a number of different trees of the same variety of fruit, thus leading to the conclusion that propagation by budding should be done by selecting buds from those trees only which show decided merit.

Fruit without blossoms, W. F. NEHRING and E. C. JOHNSTON (*West. Fruit Grower, 15 (1904), No. 7, p. 2*).—The authors in separate articles cite several instances of apple trees which bear fruit without blossoming. Mr. Nehring states that "seedless, coreless, and bloomless apples are all one and the same thing, and have been known for 40 years or more." He gives the addresses of two gentlemen who can furnish buds for grafting, and states that these trees must be planted among other trees to be pollenized.

The olive growers' convention at Sfax, DELOUPY, POUGET, and TRABUT (*Le concours oléicole de Sfax. Govt. Gen. Algeria, 1904, pp. 49, figs 28*).—An account of the olive industry at Sfax, with special reference to the manufacture of olive oil. Descriptions and illustrations are given of much of the machinery used in the manufacture of oil. Notes on the preservation of olives, on the treatment of olives for the prevention of certain diseases, etc., are included.

Report of new fruits, W. T. MACOUN (*Ontario Fruit Growers' Assoc. Rpt. 1903, pp. 121–124, fig. 1*).—Descriptions are given of a number of varieties of seedling fruits of pears, plums, peaches, grapes, and raspberries which have been sent to the author for examination. An illustration is given showing some of Doctor Saunders' hybrids from *Pyrus baccata*.

New fruits, H. L. HUTT (*Ontario Fruit Growers' Assoc. Rpt. 1903, pp. 118–120*).—The author describes a number of seedling apples, peaches, plums, and gooseberries which are considered of merit.

Influence of grafting on the posterity of the scion, JURIE (*Jardin, 18 (1904), No. 413, p. 221, figs. 2*).—Seed saved from an eggplant grafted on the tomato produced a vegetable monstrosity, which is figured. This result is believed to suggest asexual hybridity, and to indicate promising results for this method of hybridizing.

Successful new grafts in 1904, L. DANIEL (*Jardin, 18 (1904), No. 419, p. 230*).—A list is given of successful grafts made during the season with 6 families of plants.

Concerning the source of coffee, P. GUIGUES (*Bul. Sci. Pharmacol., 5 (1903), pp. 350–357; abs. in Ztschr. Untersuch. Nahr.- u. Genussmtl., 7 (1904), No. 9, p. 560*).—A descriptive article.

Yerba maté, a substitute for coffee and tea, L. H. AYMÉ (*Dept. Com. and Labor, Mo. Consular Rpts. 1904, No. 286, pp. 56, 57*).—An account is given of the preparation and use in Brazil of the tea obtained from *Ilex paraguayensis*, known as Yerba maté. It is believed that the peculiar bitter and smoky taste of Yerba maté is due to present methods of curing the leaf, and that by the use of iron and copper pans for drying a better quality of product can be secured. Maté is said to have all the good qualities of coffee and tea as a mild, stimulating health beverage, without the disadvantages of either.

Tea manufacturing (*Japan in the Beginning of the 20th Century. Tokyo: Imperial Japanese Commission to the Louisiana Purchase Exposition, 1904, pp. 151–158*).—An account of the history, present condition of the industry, the kinds of tea grown in Japan, and the markets.

A report by the controller of the experiment station, Peradeniya, H. WRIGHT (*Circs. and Agr. Jour. Roy. Bot. Gard., Ceylon, 2 (1903), No. 4, pp. 93, pls. 4*).—This is the first annual report of this station and is devoted mainly to cacao. The station contains about 150 acres and is densely covered with timber. The ground has been platted and an inventory is given of the number and kinds of trees on each

plat. In addition to about 60,000 cacao trees, the inventory shows an abundance of cocoanut, arecanut, crotons, pepper, arnatto, coffee, sapan, Ceara and Castilloa rubber, cardamoms, castor-oil plants, citrionella, nutmeg, orange, lime, and many other kinds of useful trees growing on the different plats, in all 26,746 trees.

At the opening of the station the cacao fungus, *Nectria* sp., had vigorously attacked about 96 per cent of the trees. This has been combated by clearing out shade trees so that the sunlight may penetrate, by excision of the cankered bark, and by spraying with various combinations of copper sulphate and lime or mud. Excision without first letting in sunlight was only partially successful. Spraying systematically reduced the number of pods affected with fungus, but the number of sprayings and best method of application remains to be determined.

Favorable results were secured with cacao by heaping together and partially burning a thick coating of leaves, branches, cocoanut husks, and empty cacao fruits. The final product was then buried, with or without a little lime, in trenches about a foot deep. It is believed this work combined the good effects of draining, root pruning, and manuring. An attempt was made to secure a good curing of cacao seeds which had been fermented inside the pod, and also to obtain clean, marketable seed without fermenting. "In no case did the results obtained justify the change in our method of fermenting and curing. All the seeds which were fermented inside the fruit had to be placed along with the 'black' cacao, owing to the pliable nature and unequal color of the substance of the seed. The seeds which were cured without washing had likewise to be placed with the 'black' cacao; the finished article had a dirty appearance and was very hygroscopic in consequence of the soft pulp around the seeds not being removed, and this in its turn led to the appearance of mold over the seeds. On the other hand, the unwashed seeds had a sweet taste and showed an increase in weight." The various varieties of cacao in Ceylon are described and an account is given of cacao selection and hybridization experiments now under way.

Work in the selection, culture, and curing of cardamoms has been begun, and experimental plats started of a number of fiber plants.

The food of the gods, B. Head (*London: R. Brimley Johnson, 1903, pp. IX+111, pls. 22, figs. 40, charts 3*).—This is a popular account of the early history and culture of cacao, and present methods of cocoa manufacture. Some statistical matter is given showing the production in different countries of the world. A detailed account is given of the model village of Bournville, England, where cocoa is manufactured on a very large scale.

History of cocoa, W. G. Mortimer, trans. by H. B. Gausseron (*Histoire de la coca. Paris: A. Maloine, 1904, pp. 328; rev. in British Med. Jour., 1904, No. 2267, p. 1374*).—This volume, which is an abridged translation of the second edition, gives a concise history of the discovery, characteristics, and uses of cocoa, etc.

Small fruits for 1904, L. R. Taft and M. L. Dean (*Michigan Sta. Bul. 213, pp. 3-12*).—An account of the growth during the season with descriptions of 24 varieties of strawberries, 10 of blackberries, and 3 of cherries. Experiments with cover crops in 1902 indicate that cowpeas have no value as a cover crop in Michigan orchards when sown as late as August 1. Rape and flat turnips proved of doubtful value as cover crops. Crimson clover and mammoth clover were about equally valuable. Both oats and barley proved valuable as cover crops. Both made a rank growth which froze down during the winter and formed a mulch which was of much benefit to the soil. Of these two cereals barley made the stronger growth and is preferred.

Some strawberry notes, F. W. Card (*West. Fruit Grower, 15 (1904), No. 8, pp. 14, 15, fig. 1*).—The author states that in the growing of seedlings the Hunn variety has been used extensively in crosses made and is unusually prepotent. With regard to the sex of the seedlings, it has been noted that where both parents are perfect the resulting seedlings are almost wholly of the perfect kind. If one of the parents is

imperfect the seedlings are likely to be very evenly divided as regards sex. Imperfect blossoms appear to be much smaller than perfect blossoms.

Crosses between Wm. Belt and wild strawberries have given very weak offspring. Strawberries mulched with evergreen boughs came through the winter in better condition and started into growth much better in the spring than when mulched with bog hay.

Strawberries, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 198, pp. 24, figs. 14, map 1*).—Popular directions are given for the propagation and field culture of strawberries with notes on varieties and on forcing strawberries for winter fruit.

Strawberry growing, W. L. Howard (*Ann. Rpt. Missouri State Bd. Agr., 36 (1903), pp. 260–273, pls. 3, figs. 4*).—Complete directions are given for the planting and care of strawberries including directions for irrigating, winter mulching, picking, packing, and marketing.

Dewberry record covering five years at Puyallup (*Northwest. Hort., 17 (1904), No. 9, p. 196*).—A record is given of the number of crates of berries grown and the expenses each year for 5 years for an acre of dewberries. The average net receipts for the years 1899 to 1903, inclusive, were $243.73 per acre per year.

Cranberry production, A. J. Rider (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 102–105*).—A historical account is given of the development of cranberry industry in New Jersey.

The profitable extraction of alcohol from pressed grape husks, A. J. Perkins (*Jour. Agr. and Ind., South Australia, 7 (1904), No. 11, pp. 607–614, figs. 2*).—From analyses made by the author it is estimated that the alcohol retained in the husks of grapes after being pressed is about 4.8 gal. of proof spirit per ton of fruit, or about 12.25 gal. of proof spirit per ton of marc. It is believed that under certain conditions the profitable recovery of this alcohol might be undertaken by systematic leaching in a series of tanks in a manner similar to that employed in the extraction of sugar from sugar beets by the diffusion method, followed by distillation.

With a series of 5 tanks and 5 leachings for each tank, 34.662 tons of fruit which had previously yielded 4.922 gal. of wine averaging 13 per cent of absolute alcohol, an additional 50 gal. of "piquette" averaging 7.4 per cent alcohol, or 13 per cent proof spirit, was obtained.

The fertilization of the vine, A. Cimatti (*La Concimazione della Vite. Bologna: Società Tipografica già Compositori, 1904, pp. 56, figs. 9*).—Some experiments tending to show the value of commercial fertilizers in Italian vineyards are recorded.

How the raisin is seeded, H. A. Crafts (*Home Sci. Mag., 21 (1904), No. 3, pp. 121, 122*).—A description of the process by which raisins are seeded on a commercial scale.

Rubber cultivation (*Planting Opinion, 9 (1904), No. 13, pp. 266, 267*).—An account, taken from the Mysore Gazette, is given by the superintendent of the government gardens at Mysore of the production, spread, and possible utility of the rubber tree *Manihot glaziorii*. Ceara rubber is said to grow remarkably well at Mysore. In 1885, when the first saplings were 5 years old, tappings were made and a small ball of rubber obtained, but the flow of latex at that time was very feeble.

In 1904 a series of tapping experiments were again conducted with these trees, which amply proved that the Ceara tree is quite productive of latex in the climate of Bangalore. From one single tree a yield of 7 lbs. of rubber was obtained in one year, and the tree did not appear to be in the slightest exhausted. This tree was 15 or 16 years old, and was tapped 83 times during the year.

The results of the season's experiments in tapping are believed to show that at 15 years of age and upwards every woody part of the tree, including root-limbs, is well charged with latex. Trees of the same age are not equally productive. The root-limbs are productive of latex when the trunk is nearly exhausted, and vice versa. The latex has been found to flow most freely from 6 to 8 a. m., and, excepting in

wet weather, trees may be safely tapped at short intervals all the year round. Tapping once a week would give a good average return of rubber.

The present crude methods of tapping are considered wasteful and should be replaced by an approved method, using proper tools and implements. The best season for tapping the trunk is from July to January, when the tree is in leaf. "Tapping the bark deeply, or slashing and scoring it obliquely to swell a central stream, fails to produce the best flow of latex, while it undoubtedly injures the tree, but when punctured and scored to the depth of ½ in. in the early morning the flow is usually well sustained for a couple of hours."

The gutta-percha and rubber of the Philippine Islands, P. L. SHERMAN, Jr. (*Philippine Dept. Int., Bureau Govt. Lab.* [*Pub.*], *1903, No. 7. pp. 43, pls. 41, maps 2*).—A study is given of the gutta-percha and rubber industries of the Philippine Islands based upon investigations carried on under the direction of the Bureaus of Forestry and of Government Laboratories, a preliminary report of which was made in the Report of the Forestry Bureau for 1902 (E. S. R., 14, p. 1079).

The trees producing gutta-percha are said to be among the largest and most striking of the forest trees of the islands. The author recognized 10 species, 9 of which belong to the genus Palaquium and one to Payena. The geographical distribution and characteristics of the different trees are given, after which the author describes methods of collecting and marketing their product. The physical and chemical properties of various samples of gutta-percha are shown and notes given on the propagation of the trees. The results of investigation on the propagation of the trees and scientific methods of collecting as worked out in Java and elsewhere are given.

The rubber-producing plants of the Philippines are all vines, no true rubber trees being thus far recognized as indigenous to the islands. Two species of vines are said to be well distributed, *Parameria philippinensis* and an undetermined species, both yielding a good grade of rubber. The methods of collecting rubber are described and the Philippines are discussed as a rubber-producing country through the utilization of natural supplies and through the introduction of foreign species.

Gutta-percha and rubber, P. L. SHERMAN, Jr., (*Philippine Com. Rpt. 1903, pt. 2, pp. 393–411, pls. 41, maps 2*).—This article is essentially a reprint of Bulletin No. 7 of the Department of Interior, Bureau of Government Laboratories, noted above.

Result of trial with patent palm nut cracking machine (*Rpt. Bot. and Agr. Dept.* [*Gold Coast*], *1903, pp. 7, 8*).—An account is given of tests of a machine lately placed on the market for cracking the palm nut. With the assistance of the machine a hundredweight of kernels was prepared for 7 shillings, while the same amount cracked by hand cost 12 shillings. About 19 per cent of the nuts passed through the machine unbroken.

The action of ether vapor in forcing plants, J. LOCHOT (*Rev. Hort.* [*Paris*], *76 (1904), No. 11, pp. 250–252, fig. 1*).—From a number of trials in the use of ether vapor for forcing plants, the author draws the following conclusions: The action of ether varies according to whether the shrubs to be forced have entered a state of winter repose or not. In the first case etherization will advance the flowering period only a few days, while the blossoms will be of equal luxuriance. In the latter case the period of blossoming is hastened a half and the flowering is much more perfect. In a dry atmosphere at 15° C. from 100 to 150 gm. of ether per cubic meter may be employed without danger, and in a humid atmosphere 300 gm. may be used. The duration of the etherization should correspond to the time necessary for the total evaporation of the ether. In a dry atmosphere 24 hours is sufficient, while in a humid atmosphere 36 to 48 hours are sometimes necessary. In a dry atmosphere the temperature ought not to exceed 15 to 18° C., while in a humid atmosphere it may reach 22 to 25° C. without danger. The most striking results have been obtained in the forcing of lilacs. The differences in favor of etherization with snowballs (*Viburnum opulus sterilis*), *Azalea mollis*, and *Deutzia gracilis* were less notice-

able. Etherization is most effective early in the season. After January no benefits are derived from the practice.

Forcing plants by etherization, A. MAUMENÉ (*Jardin, 18 (1904), No. 406, pp. 20-22, figs. 2*).—An account is given of the successful use of ether in the forcing of a number of varieties of lilacs and spirea.

Growing bulbs in Illinois, G. KLEHM (*Amer. Gard., 25 (1904), No. 498, p. 542*).—The author states that since about 1885 they have grown nearly 100,000 bulbs annually, consisting of tulips, narcissi, and lily of the valley. The ground selected was of low, well-drained, deep, black loam and was heavily manured with stable manure. The majority of the bulbs produced were not quite so large as imported bulbs, but in earliness and ease of forcing, the size of flower and length of stem when grown under the same conditions, little if any differences were observable. With the lily of the valley the quality of the flowers, both in size and substance and number of bells, was far in excess of the imported pips.

Begonia culture for amateurs, B. C. RAVENSCROFT (*New York: Charles Scribner's Sons, pp. 90, pls. 4, figs. 13*).—Popular directions are given for the cultivation of begonias under glass and in the open air.

Report of the committee on school gardens and children's herbariums for the year 1903, H. L. CLAPP (*Trans. Massachusetts Hort. Soc. 1903, II, pp. 239-268, figs. 13*).—The character of the work carried on at several schools in Massachusetts in growing vegetables and flowers in school gardens is outlined in more or less detail and illustrated, and a list of the prizes and gratuities awarded for the children's herbariums given.

FORESTRY.

Sylvicultural features of Larix americana, GRACE E. COOLEY (*Forestry Quart., 2 (1904), No. 3, pp. 148-160*).—Attention is called by the writer to the American larch, which, although known to be a vigorous grower, seems to have been neglected by foresters and others. The investigations upon which the paper was based were principally carried on in Hancock County, Maine, but additional observations were reported from a number of points in northern Indiana and elsewhere. The general distribution of the species throughout the western hemisphere is indicated and the characteristics of growth described.

In general the tree is closely associated with swamp localities, although the author states that it grows readily in any situation where there is sufficient freedom of soil and air for its development. The tree does not bear shade well and on this account is not well adapted to a mixed growth. According to a number of measures given the species is of rapid development when compared with other coniferous trees, specimens of 45 years being more than 60 ft. in height and 18 in. in diameter.

The larch fruits abundantly and, if given sufficient sunlight, thrives where many other seedlings would not grow. This is a very important consideration, as the species can only establish itself in ground unoccupied by other trees. A number of points are mentioned which, the author expresses the hope, should be further elucidated by study on the part of foresters, ecologists, and others.

A farm woodlot, F. A. WAUGH (*Massachusetts Sta. Bul. 97, pp. 19, figs. 13*).—A description is given of the woodlot belonging to the Department of Horticulture of the Massachusetts Agricultural College, the author seeking to set forth by concrete example the results of practical forestry under conditions which are typical of nearly the whole of Massachusetts and large areas in neighboring States.

The woodlot in question has been a source from which was obtained stove wood, fencing, lumber, etc., and contains 12.5 acres. The quality of the land is rather better than that which would ordinarily be used as a farm woodlot, but otherwise the conditions are believed to be typical. The species of trees grown in greatest abundance were chestnut, white oak, red oak, hard maple, yellow and white birch, larch, Scotch pine, and hemlock, with small quantities of other species.

The mixture of species in a woodlot is encouraged by the author on account of the easier management and greater variety of forest products. Different portions of the woodlot are illustrated in the photographic reproductions and suggestions given for the improvement of the different tracts by thinning, pruning, planting, etc.

Forest belts and notes on the arboretum, W. T. MACOUN (*Canada Expt. Farms Rpts. 1903, pp. 121–125*).—A brief report is given on the present condition of the trees in the forest belts which are, on the whole, said to be quite satisfactory. A list is given of some of the more important trees, shrubs, and herbaceous perennials growing in the arboretum, and descriptions given of a number which are attractive on account of their foliage, bark, or fruit.

Trees and shrubs, A. MACKAY (*Canada Expt. Farms Rpts. 1903, pp. 384–389*).—A list is given of trees and shrubs which have proved hardy and satisfactory in growth at the Indian Head Farm and which are recommended for cultivation throughout the territories. A list is also given of the species and varieties now under observation, together with the date of planting and notes on relative hardiness.

Exhibit of tree planting on a model prairie farm at the Louisiana Purchase Exposition, G. PINCHOT (*U. S. Dept. Agr., Bureau of Forestry Circ. 29, pp. 8, fig. 1*).—The author describes the open-air exhibit of the Bureau of Forestry, which is designed to illustrate the use of forest trees for windbreaks, hedges, and woodlots in the prairie States. The relative location and extent of woodlots, hedges, and windbreaks have been planned with reference to the actual needs and conditions. Different systems of planting and different species of trees are suggested for mixtures suitable for the different parts of the country.

Practical assistance to users of forest products, G. PINCHOT (*U. S. Dept. Agr., Bureau of Forestry Circ. 28, pp. 2*).—A statement is given of the conditions under which the Bureau of Forestry offers its assistance in the study of problems relating to the selection, testing, handling, seasoning, and preservative treatment of construction and other timbers, and the form of agreement upon which these cooperative investigations are carried on is also given.

DISEASES OF PLANTS.

A soft rot of the calla lily, C. O. TOWNSEND (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 60, pp. 47, pls. 9, figs. 7*).—An account is given of a serious disease of the calla lily which has been under the author's observation since 1899. This disease has made its appearance in various parts of the United States where callas are cultivated and has caused great loss to the growers.

A number of greenhouses where the disease was reported were visited by the writer, who found the callas rotting usually at or just below the surface of the ground. The disease sometimes extends down into the corm, sometimes upward into the leaves, and frequently in both directions. Occasionally it seems to start in the edge of the leafstalk, in the flower stalk, or in the underground part of the corm, but usually it appears at the end of the corm at or near the surface of the ground.

When a diseased corm is cut open the healthy part is found nearly white, while the diseased part has a brownish color and is soft and watery. When the leaves are involved the petioles become slimy without immediately losing their green color and as the disease progresses it extends toward the center of the petiole interfering with the transfer of material between the corm and the leaf, the edges of the leaf becoming pale and later brown. Pale spots becoming brown appear in the leaf blade and finally the whole leaf becomes brown and dead. Sometimes the disease develops so rapidly that the leaf rots off at the base and falls over without losing its green color. When the disease has progressed far enough to attack the flower stalk, the flower turns brown and the stalk without losing its color eventually falls over.

If the conditions for the development of the disease are unfavorable after the corms

are affected, the softened spots will dry up, sinking below the surrounding portion of the corm, and in these places the organism causing the disease will remain dormant until the conditions for its development again become favorable. In this way the disease is carried over from season to season and may be transported over long distances.

A microscopical examination of the affected parts shows an abundance of bacteria and the morphological characters of the organism and its physiological characteristics, as shown when grown on different media and under varying conditions, are described. Comparisons have been made between the organism causing this disease and those known to cause a number of similar plant diseases, but the organism of the calla lily differs very materially from the others and it is proposed, therefore, to call it *Bacillus aroideæ* n. sp., the technical characters of which are given.

The origin and spread of the disease are described, and it is said that the spread from plant to plant within the house seems to be accomplished mainly through the soil. The spread of the disease over long distances is accomplished as described above. The nature of the soil seems to have an influence on the spread of the disease, as soils rich in vegetable matter, filled with humus, and containing a large amount of moisture favor the rapid multiplication of the organisms.

Experiments were conducted with a number of fungicides for preventing the disease, none of which were entirely successful. The application of lime and lime and sulphur retarded the progress of the disease and in a few cases seemed to have entirely eradicated it. As the disease did not seem to be controlled by the usual methods of attention to the soil, it was found that by changing the soil every 3 or 4 years and carefully selecting the corms for planting, the disease may be held in check. The organism causing this rot was found able to attack a large number of raw vegetables, producing a soft rot in them, and on this account care should be taken not to throw any decayed or partly decayed callas where vegetables are stored or grown. It does not attack tree fruits readily, and is not likely to produce fruit rots.

Diseases of ginseng, J. M. VAN HOOK (*New York Cornell Sta. Bul. 219, pp. 165–186, figs. 25*).—It has been generally claimed that the ginseng plant is practically free from fungus enemies, and, while this may be true in a wild state, a single season's study of the cultivated plant has shown that it is subject to a number of very serious diseases. One of the most destructive is the wilt of the old ginseng plants, which may be readily recognized by the wilting of the foliage and the discoloration of the roots and rootstocks when observed in section. This disease is attributed to a species of Acrostalagmus, which, while slightly differing from *A. albus*, is not considered sufficiently different to warrant its description as a new species. The investigations so far carried on with this disease seem to indicate that it spreads through the soil and that probably by the selection of resistant varieties it can be most profitably combated.

Wilts of seedlings are also described, one of which results in the damping off of young plants caused by attacks of Rhizoctonia. In a second, which is called an end rot, the lower end of the seedling is involved, the root shrivels, and the stalk and leaves finally die, while a third form, which has been known to cause serious loss, especially in the seed beds, is due to species of millipedes.

Ginseng is also reported to be subject to attacks of nematodes, which produce their characteristic effects upon the roots. Where the ground is open and subject to heavy freezing, there is not believed to be much danger from this pest; but where it receives mulching or protection from the cold, the freezing will not destroy the nematodes.

A black rot of ginseng due to a species of Alternaria is described, as well as a soft rot which has not yet been definitely determined as due to any specific cause. In the soft-rot disease the roots decay very rapidly, becoming sticky and ill-smelling. A species of Fusarium, as well as bacteria, are usually present in great abundance, and the foliage is attacked by a species of Botrytis, but as yet the definite cause of

the root rot has not been determined. A leaf spot caused by Alternaria is described at some length, and the injury caused by snails, scale insects, and stem borers is noted.

Investigations on the prevention of Botrytis cinerea, P. DE LA BATHIE (*Rev. Vit., 21 (1904), No. 540, pp. 433–438*).—An account is given of a series of experiments for the prevention of the gray rot of grapes due to *Botrytis cinerea*. A vineyard was divided into 3 zones, the vines of one of which were sprayed, the second sprayed and the diseased leaves removed, while in the third the vines had all the diseased leaves removed but were not sprayed. The fungicides used were a trade preparation known as "Matarotine," a mixture of alum and lime, a solution of permanganate of potash, a simple solution of alum, powdered gypsum, and a mixture of lime and aluminum sulphate.

The disease appeared at 2 distinct epochs, the first between July 18 and 31 and the second at a considerable interval. None of the treatments were efficient in preventing its attack. The removing of the diseased leaves combined with the application of the fungicides appeared to slightly reduce the disease, but only to a very limited extent. In the investigations reported upon a decided difference was noted in the resistance of different varieties toward the fungus, and investigations will be continued along the line of disease resistance.

Investigations of the brunissure of grapes, L. RAVAZ (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 19, pp. 568, 569*).—The results of some experiments conducted in the vineyard of the School of Agriculture of Montpellier for the control of brunissure are given. In these experiments the author pruned the stock in various ways, cutting back some very short, others as ordinarily pruned, while a third lot were allowed to carry a great number of canes with 4 or more buds.

At fruiting time the stock bearing the least number of grapes fared best. The author maintains that brunissure is not due to any fungus, but is a result of overbearing, and the intensity of the disease is in proportion to the production and total growth of the stock. If this hypothesis is true, then diminishing the production of grapes and stimulating the vegetative growth by the use of fertilizers rich in potash will prevent the disease. It is said that in his study the author is convinced that brunissure is an infection of young vines and its recent distribution and occurrence is to be attributed to the restoration of vineyards which have been destroyed by the Phylloxera.

Grape anthracnose, P. PACOTTET (*Rev. Vit., 21 (1904), No. 525, pp. 5–8, pl. 1*).—An account is given of the grape anthracnose due to *Sphaceloma ampelinum*. This disease is said to be widely distributed and at times very serious in its injury to the grape crop. For its prevention the author recommends a winter treatment of a strong solution of iron sulphate to which is added sulphuric acid. This may be followed during the growing season by applications of other fungicides as the conditions of the season require.

Oïdium and Uncinula spiralis, J. M. GUILLON and G. GOUIRAND (*Rev. Vit., 20 (1903), No. 523, pp. 725–727*).—A review is given of the occurrence of the powdery mildew of the grape and the relation between the conidial stage, *Oïdium* or *Erysiphe tuckeri*, and the perithecial stage, *Uncinula spiralis*, pointed out.

Cultures of the black-rot fungus, P. VIALA and P. PACOTTET (*Rev. Vit., 21 (1904), No. 529, pp. 117–122, figs. 3*).—An account is given of the successful cultivation on artificial media of the black-rot fungus *Guignardia bidwellii*.

Cultures of this fungus were obtained by using portions of mycelium separated from affected grapes, the mycelium and portions of the pulp being transferred to the culture medium. After 8 to 10 days it was found that the mycelium had grown extensively and in 15 days the fungus was in the fruiting stage. The effect of acids and sugar of different kinds on the growth of the fungus is shown.

Simultaneous treatment for powdery and downy mildew, D. DONON (*Jour.

Agr. Prat., n. ser., 7 (1904), No. 21, pp. 678, 679).—The author recommends the addition of sublimed sulphur to Bordeaux mixture when spraying grapevines, the addition of the sulphur being for the purpose of preventing the occurrence of the powdery mildew.

It is recommended that to the ordinary solution of copper sulphate should be added 2.5 kg. of sublimed sulphur thoroughly mixed with the amount of lime necessary to make 100 liters of Bordeaux mixture. Instead of this preparation a second is suggested, the addition of miscible sulphur, which consists of sublimed sulphur, 70 per cent; carbonate of soda, 20 per cent, and powdered resin, 10 per cent. This can be readily added to a copper solution at the rate of 2.5 kg. per 100 liters.

The use of verdigris for the control of downy mildew, E. Chuard and F. Porchet (*Chron. Agr. Canton Vaud, 17 (1904), No. 12, pp. 351, 352*).—In reply to numerous inquiries regarding the use of neutral acetate of copper at the viticultural station, the authors give a brief account of the use of this fungicide, comparing it with Bordeaux mixture.

The verdigris solution used was a 1 per cent solution, and 2 equal plats of grapevines received a spraying of the neutral verdigris and Bordeaux mixture on the same day. Ten days later, heavy rains having fallen, an examination was made of each treated plat, and it was found that the verdigris solution was more adherent than the Bordeaux mixture. One objection to the use of this solution is that there are no evident traces of its having been applied to the vines. In order to correct this, numerous attempts have been made to add neutral substances, such as white clay, kaolin, and carbonate of magnesia, to show where the fungicide had been sprayed. As yet none of these have proved entirely satisfactory.

Simultaneous treatment for preventing attacks of the grape-fruit worm and the downy mildew, G. Martin (*Rev. Vit., 21 (1904), Nos. 531, pp. 177–180; 532, pp. 222–225; 533, pp. 241–243*).—The use of a combined fungicide and insecticide for preventing attacks of the grape-fruit worm and the downy mildew is recommended. Directions are given for the preparation and application of a mixture which consists of resin 15 kg., caustic soda 2 kg., verdigris 1 kg., ammonia 10 liters, and water 100 liters. This solution has been successfully used by the author in spraying nearly 800,000 vines.

Grape phthiriosis, L. Mangin and P. Viala (*Rev. Vit., 21 (1904), Nos. 532, pp. 205–210; 533, pp. 237–241, figs. 8*).—In continuation of the previous report on this disease of grapes due to symbiosis between *Dactylopius vitis* and *Bornetina corium* (E. S. R., 15, p. 165), the authors add a number of facts to the biology of the insect and its symbiotic fungus.

A note on the gray rot of grapes in Algeria, L. Trabut (*Rev. Vit., 21 (1904), No. 544, pp. 563, 564, fig. 1*).—Attention is called to the fructification of *Botrytis cinerea* on various portions of grapevines and particularly to the lesions caused by the fungus on the petioles and adjacent portions of the vines.

The chlorosis of fruit trees and its treatment, J. Lochot (*Rev. Hort. [Paris], 76 (1904), No. 10, pp. 236, 237*).—The use of sulphate of iron for the prevention of chlorosis is commented upon, this chemical being used not only to water about the roots, but also as a spray to the leaves. When used in too strong a solution, it frequently injures the foliage to a very considerable extent.

The author describes a treatment which consists of thoroughly spraying the trees late in autumn with a concentrated solution of copper sulphate. This treatment has been successfully applied in a number of instances, and it is further recommended for the horizontal branches of the trees that, cutting through the bark at intervals of about a foot, will aid in admitting the iron salt to the tree and obtain more rapid results. Another method mentioned is that of boring small holes into the affected trees and putting from 4 to 12 gm. of sulphate of iron into the tree trunk.

Investigations of rusts, M. A. Carleton (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 63, pp. 32, pls. 2*).—An account is given of experiments and observations on various rusts in continuation of the work reported in Division of Vegetable Physiology and Pathology Bulletin 16 (E. S. R., 11, p. 942). Notes are given relative to the rusts of a number of plants of economic importance, while others serve to elucidate some disputed points in the life history of the fungi. The studies include those of Euphorbia rust, sunflower rust, crown rust of oats, black stem rust of redtop, willow and cottonwood rusts, etc.

The author concludes from his investigations that the rust occurring on the common sunflower is identical with that on *Helianthus mollis* and *H. petiolaris*, and is probably distinct from that occurring on *H. tuberosus*. Investigations on the crown rust of oats serve to show the connection of the æcidial form on Rhamnus and the identity of the crown rust of oats with the forms known to occur on *Phalaris caroliniana* and *Arrhenatherum elatius*.

Brief accounts are given of attempts by the author to segregate to their host plants a number of species of rusts, and notes are given on the winter resistance, emergency adaptations, and perennial species of a number of rusts.

Diseases of fruits, W. T. Macoun (*Canada Expt. Farms Rpts. 1903, pp. 106, 107*).—Brief notes are given on the apple-spot fungus, the ripe rot or brown rot of peaches and plums, peach-leaf curl, and the black rot of grapes. These diseases are briefly described and suggestions given for their prevention.

Spraying, W. T. Macoun (*Canada Expt. Farms Rpts. 1903, pp. 104–106*).—Notes are given on experiments in spraying apple trees for the prevention of fungus and insect attacks. The formula recommended consists of copper sulphate 4 lbs., unslaked lime 4 lbs., Paris green 4 oz., and water 40 gal. Experiments are also reported of the use of a dust spray similar to that described in Missouri Station Bulletin 60 (E. S. R., 15, p. 166).

The experiments conducted by the author seemed to indicate that the powdered form was less satisfactory than where the usual liquid Bordeaux mixture was employed. It is believed, however, for orchards on rough ground or steep hillsides where liquids are difficult of application that the dust spray will perhaps prove of value.

The use of sulphur fungicides, E. Total (*Rev. Vit., 21 (1904), No. 542, pp. 494–497*).—The author recommends the addition of sublimed sulphur at the rate of 2.5 to 3 kg. per 100 liters of Bordeaux mixture for spraying to protect vines against black rot, gray rot, powdery mildew, etc.

ENTOMOLOGY.

Report of the entomologist, J. Fletcher (*Canada Expt. Farms Rpts. 1903, pp. 163–211, figs. 23*).—One of the most important insect pests of cereals during the year was the grain aphis. Notes are given on the prevalence of this pest in various parts of the Dominion of Canada and also on the ravages of wheat-stem saw fly, Hessian fly, locusts, and other insects of cereals.

The Criddle mixture was used successfully in destroying locusts, but the fungus disease was without effect. Considerable injury is reported from the attacks of clover-seed midge and hop aphis. The best insecticide for the latter pest consists of 4 to 5 lbs. of soft soap and 6 to 8 lbs. quassia chips per 100 gal. water. Notes are presented on a large number of insect pests of cabbage, sugar beets, and other garden vegetables and fruits. The more important fruit pests during the year were oyster-shell bark-louse, scurfy bark-louse, bud moth, apple aphis, pear psylla, pear-leaf blister-mite, and San José scale. As a result of a long series of experiments it is recommended that salt be omitted from the lime sulphur-salt mixture in combating this insect. It is also

possible to prepare the mixture without boiling. A brief account is presented of some of the more important insects of shade trees.

A report is given by J. Fixter on the apiary. Good results were had in protecting bee colonies in winter by surrounding the hives with layers of brown building paper and oil paper. The colonies of bees kept over open pails of water showed no bad effects from exposure to moisture. Good results were had in feeding bees on maple sugar, honey, and a mixture of candied honey and sugar. In treating bee colonies for foul brood, excellent results were had by the McEvoy method.

Special report of assistant superintendent of entomology to the board of commissioners, R. C. L. PERKINS (*Hawaiian Forester and Agr., 1 (1904), No. 4, pp. 75–84*).—The economic entomologists of Hawaii are chiefly occupied in preventing the importation of injurious insects and in combating those which are already present. Brief notes are presented on the organization and work of the division of entomology under the Hawaiian Board of Commissioners. Notes are also given on diseases of sugar cane as related to the leaf hopper and on the damage done to sugar cane by fungus diseases.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 6 (1904), No. 3, pp. 127–192, figs. 9*).—In this number of the proceedings the following subjects are discussed: Two new species of caddice flies; Notes on the structure of the thorax and maxillæ in insects, by Nathan Banks; On the species of Sphenophorus hitherto considered as simplex; On the species of Sphenophorus hitherto considered as placidus, by F. H. Chittenden; New Diptera from India and Australia; New North American Diptera, by D. W. Coquillet; Two new forms of Œneis; Notes on synonymy and larvæ of Pyralidæ, by H. G. Dyer; Diverse mosquito larvæ that produce similar adults, by H. G. Dyar and F. Knab; and Notes on North American Aradidæ, with descriptions of two new species, by O. Heidemann.

A critical study of the mutation and selection theories in relation to Lepidoptera, C. SCHRÖDER (*Allg. Ztschr. Ent., 9 (1904), No. 15–16, pp. 281–297, figs. 10*).—A critical review is presented of the literature relating to this subject in the study of Lepidoptera. The author maintains that mimicry and similar phenomena are easily explained on the basis of the theory of natural selection and can not be held to militate in any way against this theory.

Ants which live in symbiosis with plants in the Amazon region and in Peru, A. FOREL (*Zool. Jahrb., Abt. Syst., 20 (1904), No. 6, pp. 677–707*).—A number of ants were collected by E. Ule along the Amazon and in Peru, and a careful study of these insects disclosed the fact that they lived in symbiotic relation with various species of plants. The different species are described by the author and notes are given on their peculiar habits of life. The genera chiefly represented are Azteca, Camponotus, etc.

The biology of insects, C. KOPP (*Jahreshef. Ver. Vaterl. Naturk. Württemberg, 60 (1904), pp. 344–350*).—Notes are presented on the habits, life history, and especially on the nest construction of *Ammophila sabulosa*, *Osmia bicornis*, and other species of insects and spiders.

Agricultural pests and diseases in the Province of Bologna, D. CAVAZZA and L. ZERBINI (*Ann. Uffic. Prov. Agr., Bologna, 10 (1902–3), pp. 224–243, figs. 3*).—Brief notes are given on red spider, mites on grape vines, woolly aphis, brown-tail moth, parasitic fungi, and field mice. Especial attention is devoted to a discussion of the methods of destroying the latter. The methods discussed are drowning by submerging, poisoning, and use of infectious diseases. On ground situated favorably for submersion this method is very cheap and efficacious. In general, however, the best results are obtained from the use of arsenical and other poisons such as strychnine, nux vomica, phosphorus, potassium cyanid, etc.

The authors tested the method which has lately given such good results in France and which consists in the use of cultures of infectious diseases. The results obtained

are fairly satisfactory. A copy is given of a set of regulations adopted by the provincial council for the destruction of field mice.

A preliminary list of the insects of economic importance recorded from the Hawaiian Islands, J. G. KIRKALDY (*Hawaiian Forester and Agr., 1 (1904), Nos. 6, pp. 152–159; 7, pp. 183–189; 8, pp. 205–210*).—This list is prepared for the purpose of furnishing information regarding the number and distribution of injurious insects in the Hawaiian Islands. Lists are presented of Hemiptera, Orthoptera, Lepidoptera, and Hymenoptera of the islands with bibliographical references.

Annual report of the inspector of cocoanut trees, 1902, L. C. BROWN (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 5, pp. 161–163*).—The author made a study of a cocoanut grove in the Federated Malay States and found that many trees were cut down and left to lie in a half-rotten condition on the ground. Such trunks serve as breeding places for borers and other injurious insects. With proper precautions and the application of clean cultural methods the losses from insect pests can be gradually reduced.

Report of the government entomologist, E. E. GREEN (*Roy. Bot. Gard. Ceylon Administr. Rpts. 1903, pt. 4, pp. 10–18*).—Notes are given on the habits and life history of a number of injurious insects, in particular the more important pests of tea, coffee, cacao, rubber, timber, etc.

Further notes on pests attacking cotton in the West Indies, H. A. BALLOU (*West Indian Bul. 4 (1904), No. 4, pp. 326–354*).—Detailed notes are given on the habits, life history, natural enemies, and means of combating the cotton worm, cotton stainer, red maggot, *Eriophyes gossypii*, and various fungus diseases of cotton. As a result of the study of insect and fungus diseases of cotton, recommendations are made for the culture of cotton according to methods which will assist in preventing the damage from these pests.

The sting in the apple.—The work of the plum curculio in the apple, J. M. STEDMAN (*Missouri Sta. Bul. 64, pp. 24, figs. 10*).—During the summer of 1904 a serious attack of plum curculio on apples was observed throughout the State of Missouri. Nearly all of the injuries were due to the plum curculio, while a small percentage of damage was caused by the apple curculio.

The plum curculio attacked the apples about the middle of May and became most numerous in June. The females make punctures for the purpose of obtaining food and for the purpose of oviposition. About 5 times as many feeding punctures were observed as egg punctures. When the adult beetles appear later in the season they have the habit of eating the apple pulp, making holes of considerable size. A number of punctures may be made in the single fruit and these punctures may serve as points of entrance for fungus diseases. The plum curculio does not readily breed in the apples. Apparently not more than 15 per cent of the eggs which are deposited ever hatch and not more than 2 per cent develop to the adult condition.

Detailed notes are given on the life history and habits of this pest especially in connection with apple orchards. According to the author's experience, the pests may be successfully controlled by spraying with arsenate of lead once or twice before the blossoms open and 3 or 4 times after the blossoms have fallen at intervals of 10 days. All windfalls should be destroyed at intervals of about 7 days and the orchard should be plowed and receive shallow cultivation in the middle of July and again in August.

Observations on the habits of the asparagus fly, P. LESNE (*Rev. Hort. [Paris], 76 (1904), No. 14, pp. 332, 333, fig. 1*).—The asparagus fly (*Platyparea pœciloptera*) has long been known as an enemy of asparagus. The author made a study of the habits and life history of this pest. A great variation was observed in the time of the development of the larvæ from the egg stage. The deposition of eggs in the tissues about the tip of growing stems of asparagus appears to indicate the possibility

of a second brood of the insect. This point will be more carefully studied by the author.

The cabbage-root fly (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 6*, *pp. 352–355*).—Notes are presented on the habits and life history of *Phorbia brassicæ*. In preventing damage from this insect, the use of tarred paper or cards around the cabbage plants, sprinkling sand saturated with kerosene around the plants, and destruction of badly infested cabbages is recommended.

Report on the life history and habits of the imported brown-tail moth, C. H. FERNALD and A. H. KIRKLAND (*Boston: State Bd. Agr.*, *1903*, *pp. 73*, *pls. 14*).—A historical account is presented of the discovery of this insect in America, its gradual spread, and present distribution, together with notes on the irritation caused by the nettling hairs of the caterpillars and the injury to fruit and shade trees.

The brown-tail moth was first noted in considerable numbers in this country in 1897 and has since become distributed over a considerable portion of Massachusetts. Copies are presented of letters from various individuals who have suffered injuries from the nettling hairs of the caterpillars. The life history of the insect is described in considerable detail.

A number of natural enemies of the brown-tail moth are known, including predaceous and parasitic insects as well as birds. Reliance must be placed, however, in artificial remedies, particularly web destruction during the period from October to April, when these insects are massed together in their winter webs. These webs may be very readily detected and destroyed with the caterpillars. Other methods recommended consist in application of arsenical poisons and banding trees with sticky substances.

The true gall gnats of the pear, V. FERRAUT (*Allg. Ztschr. Ent.*, *9* (*1904*), *No. 15–16*, *pp. 298–304*).—The author discusses the synonomy of *Cecidomyia nigra*, *Sciara pyri*, *S. schmidbergeri*, and *Diplosis pirivora*. The habits and life history of the last-named species are briefly described. In combating this pest the author recommends that infested pear trees be vigorously shaken daily and that all pears which fall be at once destroyed.

A sugar-cane leaf hopper in Hawaii, D. L. VAN DINE (*Hawaii Sta. Bul. 5*, *pp. 29*, *figs. 8*).—The leaf hopper which has caused most damage to sugar cane in Hawaii has been determined as *Perkinsiella saccharicida*. This insect and the cane borer are considered as the most destructive pests of sugar cane.

Detailed notes are given on the life history of the leaf hopper and on the appearance of the insect in its different stages. The adult females injure the leaf during oviposition and the young leaf hoppers damage the plants in feeding. The attack of this pest is also followed by a fungus growth belonging to the genus Sphæronema. The first symptom of the attack of these insects is a formation of reddish spots along the midrib of the leaves.

The natural enemies of the leaf hopper can not be depended upon and the control of the pests must be brought about by artificial means. Experiments were made in testing the value of kerosene emulsion, lime dust, stripping the lower infested leaves, and collecting the leaf hoppers by nets.

The results obtained by the use of sprays, dust insecticides, and nets were not very satisfactory. In the level fields, however, before the cane has attained a height of 3 or 4 ft. it is believed that a spray of kerosene emulsion may be effectively delivered. In cases where the black fungus is abundant on the cane it is recommended that the plants be dusted with a mixture of lime and copper sulphate. In preventing the attacks of leaf hoppers the author recommends clean methods of cultivation combined with proper cultivation and the use of fertilizers.

Means for preventing damage caused by weevils and moths to stored grain, P. GENNADIUS (*Cyprus Jour.*, *1* (*1904*), *No. 5*, *pp. 5–7*).—It has been found

that in Cyprus cereals thrashed and placed in a clean storeroom early in the season are not attacked by granary insects. Some of the farmers in Cyprus scatter bulbs of squill over the piles of grain in order to prevent the attack of these insects. A number of other plants such as species of Origanum, *Inula viscosa*, etc., are occasionally used for the same purpose.

The processionary moth of the pine tree, P. GENNADIUS (*Cyprus Jour., 1 (1904), No. 4, pp. 9, 10*).—*Cnethocampa pityocampa* is common along the Mediterranean and occurs in such numbers as to strip whole groves of pine trees of their foliage. The habits and life history of this species are briefly described. The caterpillars are furnished with nettling hairs. In combating the pest the author recommends that branches bearing nests of the caterpillars be cut off and burned.

The Congo floor maggot, J. E. DUTTON, J. L. TODD, and C. CHRISTY (*British Med. Jour., 1904, No. 2281, pp. 664–666, figs. 2*).—A description is given of floor maggots as found in the Lower Congo region. These pests are reported as attacking man for the purpose of obtaining blood. Experiments with maggots show that they could live also on rats and guinea pigs. Further experiments will be made to determine whether these larvæ are capable of transmitting any form of trypanosomiasis. The larvæ were identified as belonging to the species *Auchmeromyia luteola*.

What Government experts are doing to destroy the boll weevil, C. A. WILLIAMS (*World To-day, 7 (1904), No. 4, pp. 1307–1313, figs. 11*).—The author briefly discusses the economic importance of cotton and the great injury which this industry has suffered from the ravages of the boll weevil. Attention is called to the work outlined by this Department for the control of the boll weevil and brief hints are given as to future work along this line.

The boll weevil in Texas (*U. S. Dept. Com. and Labor, Bureau of the Census Bul. 10, pp. 15–17, fig. 1*).—The history of this pest is briefly outlined with notes on its present distribution in Texas and the amount of damage caused by it.

Tortrix pilleriana and Haltica ampelophaga, J. PERRAUD (*Rev. Agr., Vit. et Hort., 1 (1903), Nos. 1, pp. 7–10; 2, pp. 25–35; 5, pp. 103–110; 8, pp. 169–172; 11, pp. 254–257; 12, pp. 265–270; 2 (1904), Nos. 14, pp. 36, 37; 15, pp. 52–54*).—The habits and life history of these insect pests of the grape vine are discussed in great detail and the various methods used for their destruction are described.

These methods consist in spraying with a large variety of insecticides, boiling water, sulphur fumes, etc. The eggs may be readily found and destroyed and various contact insecticides are useful in the destruction of the larva. For this purpose particular mention is made of tobacco juice, black soap, kerosene emulsion, and other similar insecticides. The moths may be trapped by lanterns and the use of sugar.

A number of insects prey upon both *T. pilleriana* and *H. ampelophaga*, and these species are briefly described by the author with notes on their distribution and relative importance. One of the most successful insecticide operations in connection with the caterpillars of *T. pilleriana* is the use of boiling water as a spray during the winter season.

The prey of Methoca ichneumonides, G. ADLERZ (*Ark. Zool., 1 (1904), No. 3, pp. 255–258*).—This species belongs to the family Mutillidæ and its habits were studied in the central part of Sweden. The author found that this species could attack and destroy the larvæ of tiger beetles.

Combating the olive fly, TRABUT (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 10, p. 227*).—The olive fly was observed to be easily attracted by sweetened fluids. A successful attempt was therefore made to destroy these insects by preparing a mixture of molasses, honey, glycerin, water, and arsenate of soda.

Anobium paniceum in wheat, A. LEGAULT (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 11, p. 233, fig. 1*).—Brief notes are given on the appearance and habits of this

insect. It may be destroyed by subjecting infested wheat to a temperature of 60° C. for an hour or by fumigation with carbon bisulphid.

The Hessian fly, F. DESPREZ (*Jour. Agr. Prat., n. ser., 8 (1904), No. 36, pp. 319, 320*).—The injurious attacks of this insect are briefly noted, and an account is given of its distribution. The usual remedies have been tried in controlling this pest. During the coming year it is proposed to make a further test for the purpose of studying the resistance of various varieties of wheat toward the Hessian fly.

Pebrine and related micro-sporidia, A. LUTZ and A. SPLENDORE (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 5, pp. 645–650, pls. 2, fig. 1*).—Species of Nosema and related organisms were found by the authors as parasitic in a considerable variety of insects. These organisms are described and notes are given on their life history, distribution, and economic importance.

The life history and treatment of a common palm scale, H. E. HODGKISS (*Reprinted from Massachusetts Agr. Col. Rpt. 1904, pp. 12, pls. 2*).—The life history and appearance of *Chrysomphalus dictyospermi* are described, with notes on the systematic position of this insect, its food plants, economic importance, and methods of combating it.

The author conducted a number of experiments in fumigating infested greenhouses with hydrocyanic-acid gas for the purpose of determining the proper quantity of chemicals to be used. As a result of these experiments, it is recommended that 0.075 gram, or a maximum of 0.1 gram of cyanid of potash, be used per cubic foot of space for a period varying from 20 to 40 minutes, according to the amount of chemical used. Palms should be free from moisture, fumigated only after dark, and greenhouses should be properly ventilated after fumigation.

The pineapple scale, D. L. VAN DINE (*Hawaiian Forester and Agr., 1 (1904), No. 5, pp. 111–114*).—Notes are given on the distribution and occurrence of *Diaspis bromeliæ*. The natural enemies of this insect are considered to be of no importance to the planter. For combating the pest the author recommends the use of kerosene emulsion or resin wash.

The mussel scale (*Bd. Agr. and Fisheries [London], Leaflet 107, pp. 4, figs. 2*).—The mussel scale or oyster-shell bark-louse is described and insecticide applications are recommended for its destruction. Notes are given on the preparation and use of hydrocyanic-acid gas.

Plant lice (*Bd. Agr. and Fisheries [London], Leaflet 104, pp. 3*).—A brief account of the life history, occurrence, natural enemies, and artificial remedies of these pests.

A Castilloa borer, H. N. RIDLEY (*Agr. Bul. Straits and Federated Malay States, 2 (1903), No. 10, p. 322*).—Young trees of the species *Castilloa elastica* are reported as being greatly injured by a borer identified as *Epepseotes luscus*. The beetle is described and notes are given on its habits. It flies by night. The grubs may be destroyed in the trunks of the tree by means of curved wires and insecticides.

Notes on two insects, W. CARTWRIGHT (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 1, pp. 17–19*).—The larvæ of *Trypeta capitata* were found injuring oranges by feeding on the pulp of the fruit. In controlling this pest it is recommended that fallen fruit be at once collected and destroyed and that the soil under infested trees be treated with ferrous sulphate. The author observed considerable injury to barley from the attacks of *Hylemyia coarctata*. Stimulating fertilizers and rolling of the ground are recommended in controlling the pest.

The ichneumons of Great Britain, C. MORLEY (*Plymouth: James H. Keys, 1903, pp. L+315, pl. 1, figs. 19*).—It was felt that this group had not been considered in a monographic form in Great Britain, and the present volume was therefore prepared to supply the demand for such information. The various species are described and notes are given on their habits, life history, and means of distribution. A glossary of technical terms is added to the volume, together with an index of synonyms and a list of the hosts on which the ichneumons live.

[Monthly bulletin of the Division of Zoology], H. A. SURFACE (*Pennsylvania State Dept. Agr. Mo. Bul. Div. Zool., 2 (1904), No. 4, pp. 99–128, pls. 2*).—Practical remedies are suggested for insect pests which are most prevalent in August, and notes are given on mosquito bites, bee stings, insects as carriers of disease, shade-tree pests, bird preservation, etc.

[Monthly bulletin of the Division of Zoology], H. A. SURFACE (*Pennsylvania State Dept. Agr. Mo. Bul. Div. Zool., 2 (1904), No. 5, pp. 131–160, figs. 5*).—Brief notes are given on practical measures for controlling insects and fungus diseases of various crops, together with short accounts of spraying apparatus, inspection of nurseries, rearing insects, etc.

Nocturnal moths and lantern traps, J. A. SOBRAL (*Bol. Agr. São Paulo, 5. ser., 1904, No. 6, pp. 269–271*).—As a result of various tests with lantern traps for the purpose of catching injurious night-flying moths, the author recommends that such lanterns be placed not farther apart than 25 meters.

The use of hydrocyanic acid as an insecticide, A. RICHON (*Rev. Hort. [Paris], 76 (1904), No. 15, pp. 358–360*).—Detailed notes are given on the effect of this gas upon various insects and plants. Thrips and various species of plant lice, red spider, and various caterpillars were destroyed by doses varying from 1 to 3 gm. of cyanid of potash per cubic meter of space applied for periods of from 20 to 40 minutes. Some delicate plants were very much injured by the use of 3 gm. of cyanid of potash per cubic meter of space. With the observation of proper precautions, however, this remedy is considered safe as well as very effective.

Disinfection of greenhouses by hydrocyanic acid, COSTANTIN (*Rev. Hort. [Paris], 76 (1904), No. 8, pp. 191, 192*).—Formulas are given showing the required amounts of cyanid of potassium, sulphuric acid, and water in the development of hydrocyanic acid of the proper strength to destroy injurious insects without injuring ordinary greenhouse plants.

The author finds that the amount of cyanid of potassium may vary from 2½ to 3½ gm. per cubic meter of space, according to the delicacy of the plants to be fumigated. It was found that most plants are unharmed by these strengths if kept dry just before and during the process of fumigation. Plant lice, thrips, red spider, mealy bugs, and various species of scale insects were successfully destroyed by one fumigation. The efficacy of fumigation with hydrocyanic acid was considerably superior to the use of nicotine or fumigation with tobacco.

Report of the inspector of fumigation appliances, 1903, P. W. HODGETTS (*Toronto: Ontario Dept. Agr., 1904, pp. 12*).—A brief outline is presented of the conditions observed in nurseries and orchards in various parts of Canada with reference to infestation with San José scale.

Infested nurseries are inspected and fumigated in the spring and fall. The formula for the development of hydrocyanic acid includes 1 ounce cyanid, 1 fluid ounce sulphuric acid, and 3 fluid ounces water per 100 cubic feet of space. A copy is given of an act passed for the prevention of the spread of San José scale, together with regulations based on this act for the fumigation of nursery stock.

Preparation and use of kerosene emulsion, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 10, pp. 6*).—Brief notes on the formulas for the preparation of kerosene emulsion, with an account of the proper methods of preparing, diluting, and applying this insecticide.

Fumigation of nursery stock. Inspection laws of other States, W. NEWELL (*Georgia State Bd. Ent. Bul. 11, pp. 23, figs. 7*).—The regulations of the Georgia State Board of Entomology regarding the fumigation of nursery stock are briefly outlined, with notes on fumigation, apparatus, chemicals, construction of fumigating houses, etc. Formulæ are given for computing the amount of chemicals required for given spaces. The requirements of various States with regard to fumigation are also discussed.

Experiments to test the value of Bug Death as compared with Paris green and Bordeaux and Paris green on potatoes, R. ROBERTSON (*Canada Expt. Farms Rpts. 1903, pp. 296, 297*).—The experiments reported with these insecticides indicate that many of the treatments are effective in destroying potato beetles, but that Paris green is exceedingly cheap as compared with treatment by means of Bug Death.

Chemistry of insecticides and fungicides, F. T. SHUTT (*Canada Expt. Farms Rpts. 1903, pp. 152–155*).—Analyses are presented of Kno Bug, Bug Finish, and formalin. Insecticidal properties of Kno Bug and Bug Finish were found to be fairly satisfactory, but the claims made concerning the fertilizing action of these preparations are quite unfounded. The products also cost much more than homemade insecticides. According to analyses made by the author the amount of formaldehyde by weight in commercial formalin varies from 36 to 37 per cent. An analysis was made of Owens' compound for the protection of trees against insect and fungus ravages. This preparation was found to consist largely of sulphur to which from 5 to 10 per cent of charcoal had been added.

Spraying calender, L. R. TAFT and C. D. SMITH (*Michigan Sta. Spec. Bul. 26, folio*).—Recommendations are made in a tabular form of insecticides and fungicides to be applied in controlling the more important insect and fungus diseases of fruits and garden vegetables. Formulas are also presented for the preparation of these sprays.

Supplementary notes on the tsetse flies, E. E. AUSTEN (*British Med. Jour., 1904, No. 2281, pp. 658–662, fig. 1*).—Descriptive, biological, and economic notes are presented on several species of the genus Glossina. This article is intended to contain information supplementary to the author's monograph of tsetse flies. The habits of these insects in their various stages are described in considerable detail, especially in relation to their agency in the transmission of diseases. An analytical table is presented for the determination of the species.

Malaria and mosquitoes, G. MCCARTHY (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 6, pp. 66–76, figs. 10*).—The life cycle of the malarial parasite is briefly outlined and notes are given on the habits and life history of a number of mosquitoes which commonly occur in North Carolina, with especial reference to the species concerned in transmitting malaria. Approved methods of destroying mosquitoes are recommended.

The honeybee, T. W. COWAN (*London: Houlston & Sons, 1904, 2. ed., pp. XII+220, pl. 1, figs. 73*).—This volume has been revised so as to include some of the more recent work on the habits and biology of the honeybee. The volume is occupied chiefly with a scientific and entomological discussion of this insect rather than with its economic importance. Especial chapters are devoted to the gross and microscopical anatomy of various organs of bees, and an account is presented of drones, queens, parthenogenesis, metamorphosis, and comb construction.

Bees, S. A. BEDFORD (*Canada Expt. Farms Rpts. 1903, p. 338*).—Some losses in bees are reported as a result of inadequate stores during the winter. The best success was had in shipping bees in the Langstroth hives. Sweet clover is considered as a very good and productive bee plant.

Chemistry of bee keeping, F. T. SHUTT (*Canada Expt. Farms Rpts. 1903, pp. 155–158*).—Experiments carried on during the year under report showed that extracted honey exposed to an atmosphere saturated with moisture soon exhibited signs of deterioration, becoming thin and rapidly fermenting. Honey in the comb was similarly affected, but resisted the effects of moisture for a much longer time. It is recommended on the basis of these experiments that honey be stored in a warm, dry atmosphere. Notes are given on the analysis of beeswax, some of which was found to be greatly adulterated with paraffin.

Studies on the poison of bees, C. PHISALIX (*Compt. Rend. Acad. Sci. Paris, 139*

(*1904*), *No. 4*, *pp. 326–329*).—As the result of a prolonged chemical and biological study of bee poison the author concludes that this poison contains 3 distinct active principles, viz., a body which causes an elevation of temperature and which is destroyed at a temperature of 100° C., a toxin which produces muscular convulsions and which does not resist prolonged boiling, and a toxin which exercises a stupefying effect and which is not completely destroyed until a temperature of 150° C. is reached.

The existence of 2 toxins exhibiting antagonistic action is considered a new discovery, and further study will be made for the purpose of determining whether this fact can be made use of in a practical manner.

Sericulture (*Japan in the Beginning of the 20th Century. Tokyo: Imperial Japanese Commission to the Louisiana Purchase Exposition, 1904, pp. 133–150*).—A historical statement is presented regarding government aid to this industry in former times, legislative measures for protecting sericulture, together with numerous data on the present condition of the industry in Japan. Statistics are presented on silkworm eggs, silk production, and reeling.

FOODS—NUTRITION.

Hygienic studies of flour and bread. XIII, Concerning flour, dough, and bread acids, DOMBROWSKY (*Arch. Hyg., 50* (*1904*), *No. 2*, *pp. 97–117*).—Various problems connected with the acidity of flour and bread were studied. Among the conclusions drawn were the following: The total acidity of the samples analyzed, calculated as lactic acid, ranged from 0.36 to 0.52 per cent of the dry matter with rye flour and 0.23 to 0.4 per cent with wheat flour. The acidity of dough is influenced aside from the time and temperature of the fermentation by the quantity of water used in mixing, that is, by the concentration of the dough.

By kneading the dough with water about 75 per cent of the total acid present may be readily removed. When bread is baked, 75 per cent of the acid of rye bread, 70 per cent of that of gray bread, and 58.5 per cent of that of wheat bread remains in the loaf. Other conclusions have to do with the kind and amount of the acids present and the relation of acidity to yeast and other micro-organisms.

Concerning wheat flour, H. STEIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 12*, *pp. 730–742*).—Different methods of separating gluten were compared, and the properties of gluten, methods of examining wheat flour, and the ferments of wheat were studied. According to the author, the addition of separated gluten to wheat flour might be profitably undertaken by bakers in place of blending. As regards the ferments of wheat, the author considers it probable that 2 are present, one of these apparently softening the gluten. The effect of wheat ferments on the character of the dough is briefly spoken of.

Examination of foods, condiments, and commercial products, M. BALLÓ (*Jahrb. Chem. Nahr. Untersuch. Budapest, 4* (*1901–3*), *pp. 123; abs. in Oesterr. Chem. Ztg., 7* (*1904*), *No. 12*, *p. 273*).—Data are given regarding the examination of a large number of foods and condiments.

The effect of alcohol, alcoholic drinks, tea, and coffee upon peptic digestion, N. J. PAWLOWSKI (*Russk. Vrach., 2* (*1903*), *p. 1475; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8* (*1904*), *No. 2*, *pp. 156, 157*).—Tea and coffee, according to the author, diminished the digestive action of pepsin, an effect which must be attributed to some other constituent than caffein, since this was shown to have no effect on the digestion of protein by pepsin. Alcohol and alcoholic beverages also diminished the ferment action in the experiments reported. Conclusions were also drawn regarding the other subjects studied.

Concerning the chemical composition of coffee and coffee substitutes, F. DUCHÁČEK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8* (*1904*), *No. 2*, *pp. 139–146*).—The composition of the original material and extract matter of coffee and coffee sub-

stitutes was studied, the extract analyses including mineral constituents. The presence of caffein in coffee is, according to the author, the most important difference between true coffee and coffee substitutes. The differences in composition between the two classes of goods are spoken of.

A new method of preparing foods, S. Weisbein (*Berlin. Klin. Wchnschr., 40 (1903), pp. 587–590; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 12, pp. 751, 752*).—A method of preparing a food product rich in gluten is described, which consists in mixing wheat flour with water and separating the gluten and salts from the bulk of the starch by means of a centrifugal machine. The portion containing gluten is dried and ground to a powder.

Some food products and their adulteration, H. G. Knight and R. B. Moudy (*Wyoming Sta. Bul. 62, pp. 55*).—Since the State pure-food law went into effect in September, 1903, a total of 425 samples of canned goods, butter, cheese, meats, condiments, beverages, etc., have been examined, of which 268 were found to be adulterated or misbranded. The adulteration was especially noticeable with canned goods and spices and condiments, 118 of the 126 samples of canned goods and 50 of the 98 samples of spices and condiments being adulterated or misbranded. Of the 5 samples of catsup examined all were adulterated or misbranded.

Concerning food preparations, A. Jolles (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 7, pp. 515–531*).—A number of commercial food products of recent introduction are described and their nutritive value discussed.

The household food supply, R. E. Turnbull (*Jour. British Dairy Farmers' Assoc., 17 (1902), pp. 29–39*).—The amount and value of food consumed in Great Britain is discussed with special reference to dairy products.

Naval dietary, J. Falconer-Hall (*British Med. Jour., 1904, No. 2275, pp. 272–274*).—The components of the British naval ration are enumerated, and food value, methods of preparation, issue of food components, and other topics are spoken of. According to the author's calculation, the ration furnishes per man per day 4.1 oz. protein, 2.1 oz. fat, and 20.2 oz. carbohydrates.

The chemical composition of different sorts of fish and the periodical variations which fish flesh undergoes, H. Lichtenfelt (*Arch. Physiol. [Pflüger], 103 (1904), No. 7–8, pp. 353–402, figs. 2*).—From a large amount of analytical data the author concludes that the muscular tissue of fish undergoes a periodical change in composition, which depends upon the age of the individual, the food eaten, and the spawning season.

The effect of hunger on the composition of the muscular tissue is to increase the percentage of water and correspondingly to diminish the dry matter. The greater the proportion of fat present, the larger the loss of fat in the muscles, especially as compared with the so-called lean varieties. Not only in the case of Rhine salmon, but also with other species of fish, hunger causes a diminution of proteid material. The amount of insoluble proteid is always diminished. The proportion of soluble proteid is sometimes increased, but may also be diminished.

This indicates that the different sorts of nitrogenous compounds have different physiological values. Muscular work in connection with hunger seems a combination especially suited to increase the amount of soluble proteids in fish flesh.

Examination of caviar, P. Buttenberg (*Ber. Hyg. Inst. Hamburg, 1900–1902, pp. 13–15; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 4, pp. 233–235*).—Analytical data are reported.

A number of food products made from fish roe, E. Rimini (*Staz. Sper. Agr. Ital., 36 (1903), pp. 249–278*).—Analyses of caviar and similar products are reported.

The coloring matter and fat of egg yolk and the detection of egg yolk in foods, Laves (*Versamml. Deut. Naturf. u. Ärzte Cassel, 1903; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 12, pp. 754, 755*).—The constituents of egg yolk

and the estimation of egg yolk in food products are spoken of, as well as the importance of convenient food products which contain egg yolk.

The hygienic value of preserving meat, HÜTTNER (*Deut. Vierteljschr. Öffentl. Gesundheitspfl., 35 (1903), pp. 501–553; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 12, p. 749*).—From a discussion of the subject the author concluded that only fresh flesh of healthy animals should be preserved. Cold storage is regarded as the best method of preserving meat, Appert's method being very satisfactory for canning. The use of antiseptics, with the exception of common salt and smoke, in his opinion, should be forbidden. He points out that no sort of preserved meat should be used for a very long time and that preserved meat should be cooked. Other questions having to do with the subject of preserved meats are also considered.

Concerning unwholesome meat, H. VALLÉE (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 26–34*).—The author discusses spoiled meat, the flesh of diseased animals, the unwholesomeness of such articles, regulations limiting their use, and related topics.

Borax as a preservative, E. ROST (*Borsäure als Konservierungsmittel. Berlin: Julius Springer, 1903, pp. 102+62*).—This publication contains a summary of investigations on the general question of borax and borax compounds as preservatives, including the author's own work, and is in part a critical discussion. A number of general conclusions are drawn, among others the following: Borax is a preservative of low disinfecting power and must be used in large quantities to insure protection; it may be deceptive in that it increases the weight of the food material and enables it to retain a greater amount of water than is the case when, for instance, it is preserved by pickling with salt or by smoking; it may produce harmful results immediately after consumption, and is regarded as cumulative. In addition to controversial matter, the supplement contains the text of a proposed law to prevent the addition of harmful products to meat and meat products.

Saltpeter in meat products, ORLOW (*Rev. Internat. Falsif., 16 (1903); abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 91, 92*).—On the basis of experiments the author concluded that the red color of corned meat is due to nitrites rather than saltpeter. The presence of nitrites was also noted in fresh meat. Possible danger from the presence of nitrites in any considerable amount is pointed out.

Chemical and sanitary studies of sausage and chopped meat, A. J. SENNING (*Inaug. Diss., Univ. Dorpat., 1903, pp. 91; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 12, p. 751*).—The author reported analyses of a considerable number of samples.

Concerning the constituents of asparagus, E. WINTERSTEIN and P. HUBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 12, pp. 721–730*).—The authors studied the composition of the juice and dry matter of asparagus, especially the distribution of nitrogen in the juice.

Note on a new food plant from Central Africa, C. CHALOT (*Agr. Prat. Pays Chauds, 4 (1904), No. 19, pp. 104–106*).—A description of a tuber eaten in Africa called dazo (*Coleus dazo*), with an analysis by P. Ammann.

Concerning milk chocolate, O. LAXA (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 8, pp. 471–477*).—On the basis of composition, the author discusses the identification of true milk chocolates and those not true to name.

Concerning the changes brought about in noodles by storage, H. JAECKLE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, pp. 513–528*).—Experimental data are reported and discussed with reference to judging the quality of noodles.

Table fare of the Virginia Mountains, S. B. HACKLEY (*What-to-Eat, 17 (1904), No. 2, pp. 78, 79*).—A popular descriptive article.

Results of borax experiment, H. W. WILEY (*U. S. Dept. Agr., Bureau of Chem-*

istry Circ. 15, pp. 27).—The investigations summarized have been noted from another publication (E. S. R., 16, p. 182).

Handbook of nutrition and dietetics in relation to therapeutics, E. von Leyden, revised by G. Klemperer (*Handbuch der Ernährungstherapie und Diätetik. Leipzig: Georg Thieme, 1903, vol. 1, pp. X+502, dgms. 2; 1904, vol. 2, pp. VIII+579, fig. 1*).—The general theories of nutrition in relation to the treatment of disease are discussed. The volumes are largely made up of special articles by different authors on a variety of topics related to the general subject under consideration. The introduction states that some of the chapters have been entirely rewritten.

Scope and results of the nutrition investigations in the United States, L. Grandeau (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 1–17*).—A summary and discussion of the nutrition investigations which have been carried on under the auspices of the Office of Experiment Stations.

The value of sugar in the diet of soldiers, Boigey (*Caducée, 1904, Jan. 9; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 90, 91*).—It was found that when 40 gm. of sugar was added to the diet of soldiers for a long period gains in weight were made, but in a number of cases unfavorable symptoms resulted. In the abstract cited it was pointed out that this was to be expected, since a corresponding amount of other energy-yielding foods were not omitted when sugar was added to the ration.

Sugar in the diet of soldiers, Bienfait (*Caducée, 1904, Feb. 6, p. 40; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, p. 91*).—The author discusses Boigey's experiments on sugar and does not share his conclusions.

Statistical investigations of the diet of workmen, E. Waxweller (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 17–24*).—A brief account of investigations regarding the diet of Belgium workingmen, conducted by the Solvay Institutes.

The utilization of vegetable proteids by the animal organism, E. W. Rockwood (*Amer. Jour. Physiol., 11 (1904), No. 4, pp. 355–369*).—Experiments with dogs and men are reported on the digestibility of oatmeal prepared in different ways and of separated oat proteid. When slightly cooked and well cooked oatmeal were compared, it was found in every case that the digestibility of the proteid was increased by long cooking, and "it is a natural supposition that this is the result of the breaking down of the cell walls and the easier access of the digestive enzyms to their contents."

In one series of experiments with dogs, meat, separated oat proteid, and malted oats were compared, and in another, oat proteid, rolled oats, meat, and zein. In these and the other experiments mentioned the balance of income and outgo of nitrogen was determined. Some of the results obtained follow:

Digestibility of protein of oats and other foods—Experiments with dogs.

Food.	Method of preparation.	Digestibility of protein.
		Per cent.
Meat with lard and cracker dust, average 4 tests	Raw	5.6
Malted oats	do	8.8
Coarse oatmeal, average 2 tests	Cooked 5 to 8 minutes.	17.5
Rolled oats	do	13.8
Oat proteid, first test	do	4.4
Oat proteid, second test	do	10.5
Zein, first test	do	22.4
Zein, second test	do	10.5
Fine oatmeal, average 2 tests	Cooked 4 to 6 hours	15.1

The principal conclusions drawn were in effect as follows: It is evident that without their removal from the materials associated with them the vegetable proteids are

not utilized to the same extent as those of animal origin. The degree of utilization is somewhat, although only slightly, increased by long cooking. Rolling out into thin flakes, as in the rolled oats, also appears to have some effect; but oats thus treated yield nearly as much fecal nitrogen as the others.

The technical process employed in the preparation of the malted oats seems to favor utilization, and this may be explained by their partial hydration. In one of the tests the extracted vegetable proteid was found to be as well utilized as the animal proteids. In the other test the agreement was less marked. In the former case the large amount of starch presumably kept the proteid particles from drying together into a comparatively impervious mass. "There is, consequently, no evidence from these experiments to indicate that the oat proteid, per se, is less readily utilized than is that of lean meat. This corresponds with the experience gained from feeding the vegetable proteid, edestin. . . .

"It may be objected that the presence of the milk [as part of the diet] . . . vitiates the conclusions derived from these trials. In all the experiments with dogs (except with zein feeding), the proportion of milk to the proteid studied was constant, and of the latter the same amount was used whenever practicable. Hence it is believed that the figures represent fairly the comparative degree to which the animals utilized the proteid.

"The greater fecal nitrogen from zein is probably not due so much to its being less digestible as to the insolubility of the substance and the inability of the digestive enzyms to act vigorously, except upon the surface of the impervious masses. When the zein was thoroughly dried its utilization was still further lessened. There is no reason to doubt that if the zein could be freed from the materials with which it is associated, except the starch, its utilization would be increased. The facilitating effect of the presence of starch was shown with the oat proteid in [one of the tests]. The achievement of means for removing the substances which interfere with digestion is worthy of study."

Absorption of diets rich in protein and fat and poor in protein and fat, J. König (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *7* (*1904*), *No. 9*, *pp. 529–545*).—Experiments on the digestibility by healthy men of a diet rich in protein and fat were carried on in cooperation with F. Reinhardt. The foods especially studied were young peas, ripe peas, purple cabbage, string beans, coarse rye bread, and Graham bread. They were combined with other foods to form a simple mixed diet of the character indicated.

It was found that the protein of purple cabbage, string beans, and coarse rye bread was not well assimilated, a larger part of the nitrogenous material of such food being excreted in the feces than was the case with wheat bread and shelled legumes. The crude fiber found in the feces contained more carbon than that contained in the food, which, in the author's opinion, shows that the crude fiber with low carbon content was generally digested, while the bodies having a high carbon content, such as lignin, accumulated in the feces in fairly large amounts. The digestibility of pentosans in these experiments has been noted from another publication (E. S. R., 13, p. 877).

Experiments on the digestibility of a diet with limited amounts of protein and fat were carried on in cooperation with Pollitz and H. Romberg. The results showed that when the diet contained meat and considerable fat, much less protein and fat was excreted in the feces than was the case with a diet containing limited amounts of protein (meat) and fat. The nitrogen-free extract was about equally digestible in the 2 cases, while pentosans and crude fiber were less digestible when small amounts of protein and fat were consumed.

Concerning phosphorus, calcium, and magnesium metabolism in adult man, R. Renvall (*Skand. Arch. Physiol.*, *16* (*1904*), *No. 12*, *pp. 94–138*, *pl. 1*).—The author, who was 22 years old, was himself the subject of the tests reported on the

metabolism of nitrogen and ash constituents. Full analyses of food and excretory products were made, the income and outgo of nitrogen, phosphorus, calcium, magnesium, and ash being determined.

In the author's opinion the results obtained with nitrogen were in accord with those of other investigators.

In the 32 days of the test the phosphorus in the mixed diet consumed ranged from 1.226 gm. to 2.105 gm. per day. On every day except one the total amount excreted was greater than the amount consumed. In other words, in the form in which it was consumed the amount of phosphorus was not sufficient for the body needs. However, in one period the amount consumed was 2.103 gm. per day and the average loss was only 0.030, showing that only a little more would have been required for equilibrium. During a supplementary period when the diet was selected without restriction the amount of phosphorus excreted was about the same as during the experiment proper.

As regards calcium, the author found that the larger proportion was excreted in the urine, though as he notes others have found that the feces contain the greater amount. It is pointed out that the observed facts may perhaps be explained by individual peculiarity or by the character of the food. The amount of calcium consumed ranged from about 0.9 to about 1.5 gm. Considering the test as a whole there was a small gain of calcium.

In the author's opinion the body was able to gain this element only in limited quantity. During part of the time some calcium carbonate was consumed, a portion of which was apparently resorbed. The author calculated that since the amount of calcium which he required was 1.2 gm., an older man, whose skeleton was completely formed, would require less than 0.7 gm. per day, considerations which would indicate that there is little danger of the supply in the food being inadequate to meet the body demands.

The amount of magnesium supplied by the diet was from about 0.4 to 0.6 gm. per day; when the larger amount was consumed there was a small gain. The magnesium requirement was calculated to be about 0.45 gm. per day. About 30 per cent of the magnesium consumed was excreted in the urine and 70 per cent in the feces.

The diet supplied from about 30 to 38 gm. total ash per day. Considering the test as a whole there was a loss of 31.2 gm. The amount not accounted for by the ash constituents measured, it is pointed out, must have been made up largely of sodium, potassium, and chlorin. The author notes that in the urine the principal ash constituent is sodium chlorid and in the feces phosphoric acid.

The author and 2 other young men were the subjects of some tests which were undertaken to ascertain the amount of nitrogen, phosphorus, calcium, and magnesium in the intestinal secretions. The diet consisted of sago cooked in water, sweetened with sugar, and flavored with a little citric acid and raspberry juice. In 2 tests reported the nitrogen in the feces amounted to 1.5 and 1.52 gm. per day, the phosphorus 0.223 and 0.229, calcium 0.163 and 0.165, and magnesium 0.064 and 0.067.

In one test the fat in the feces was determined and amounted to 2.5 gm. per day. The results obtained are discussed at length and compared with those of other investigators. The author notes that when small amounts of ash constituents are supplied, the body limits the amounts excreted. Since the energy requirements of the body were nearly supplied by the diet furnished, smaller amounts of body tissue were broken down than would be the case in fasting.

A new apparatus for studying the respiratory metabolism of man, A. Jaquet (*Verhandl. Naturf. Gesell. Basel, 15 (1904), No. 2, pp. 252–271, pl. 1*).—A respiration apparatus, which is designed especially for studying the respiratory quotient with men, is described. The apparatus consists of a respiration chamber, its capacity being 1,387 liters, provided with a folding bed and other conveniences, windows for lighting, telephone, and a food aperture for the convenient introduction of food into

the respiration chamber and the removal of excreta. The respiration chamber is of such size that a man may remain in it in comparative comfort for a period of twenty-four hours. The air drawn through the respiration chamber is measured with a gas meter and aliquot samples analyzed.

Alcohol check experiments, which are very briefly reported, led the author to conclude that the apparatus is very accurate. Some analytical data of experiments with men are also given. The simplicity of construction of the apparatus is, in the author's opinion, a point in its favor.

Concerning the action of sulphur on proteid bodies, M. HAUSMANN and A. HEFFTER (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 5-6, pp. 213-233*).—It has been observed that when white of egg is treated under proper conditions with finely divided sulphur, hydrogen sulphid is produced. The authors studied this reaction at length with egg white and other proteids.

According to their investigations it appears that crystallized ovalbumin, and perhaps also conalbumin, as well as an unidentified proteid found in animal tissue, possess the property of forming hydrogen sulphid from sulphur at an ordinary temperature (40° C.) and do not lose this property when cooked. The reaction was also produced by a body in blood cells, but whether in the case of this substance also the reaction was unaffected by cooking, and the body therefore was to be classed with the similar substance obtained from organs, can not be stated.

All proteid bodies do not possess the property of forming hydrogen sulphid from sulphur at room temperature. It was found that the globulins of white of egg and blood serum, fibrin, serum albumin, the proteids of milk and other secretions did not possess it. Neither did Witte peptone and commercial hemialbumose form hydrogen sulphid. Gelatin and yeast nuclein were also found to be inactive at room temperature. When cleavage was induced in ovalbumin and probably in the other active proteids by pepsin, the active properties were destroyed.

A number of experiments were carried on to ascertain the cause of the observed phenomena. It was found that a formation of hydrogen sulphid from sulphur was brought about by a number of mercaptans, and it is suggested that in the case of proteids the reaction may be due to the presence of mercaptan radicals.

Certain questions which have to do with proteid metabolism, W. FALTA (*Verhandl. Naturf. Gesell. Basel, 15 (1904), No. 2, pp. 206-224, pl. 1*).—The experiments reported have to do with the source of nitrogenous excretory products and the cleavage of protein in the body.

The effect of pancreas upon proteid formation, P. BERGELL and F. BLUMENTHAL (*Arch. Physiol. [Pflüger], 103 (1904), No. 11-12, pp. 627-631*).—Experimental data are reported and discussed.

The effect of sea climate and sea baths upon metabolism in man, A. LOEWY and F. MÜLLER (*Arch. Physiol. [Pflüger], 103 (1904), No. 9-10, pp. 450-475, figs. 2*).—The experiments reported showed that sea climate and sea baths have an effect on metabolism with certain persons, but did not show the reasons for this.

Phosphorus medication: Glycero-phosphates, lecithins, nucleins, H. LABBÉ (*La médication Phosphorée: Glycero-phosphates, lécithines, nucléines. Paris: J. B. Baillière & Sons, 1903, pp. 96; rev. in British Med. Jour., 1904, No. 2267, p. 1374*).—The faulty assimilation of phosphorus and inorganic phosphorus compounds is spoken of. More favorable results attend the use of organic compounds, and the author discusses lecithins, nucleins, and similar bodies.

Concerning myogen, a new protein preparation, R. O. NEUMANN (*München. Med. Wchnschr., 50 (1903), pp. 106-108; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 9, p. 557*).—A descriptive article.

The utilization of heat produced by animals, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 7 (1904), No. 23, pp. 737, 738*).—A discussion from a quantitative standpoint of the energy outgo of the body.

The estimation of carbohydrates in feces, S. WEISER and A. ZAITSCHEK (*Landw. Vers. Stat., 58 (1903), Nos. 3–4, pp. 232–237*).—From experiments reported the conclusion was drawn that it is absolutely necessary to estimate the amount of pentosans present in feces whenever their starch content is taken into account.

The sulphurous acid of foods bound in organic compounds, K. FARNSTEINER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 8, pp. 449–470*).—The author studied especially the form in which sulphurous acid is found in fruit products and its union with carbohydrates.

The formation of sugar from fat, E. ABDERHALDEN and P. RONA (*Ztschr. Physiol. Chem., 41 (1904), No. 4, pp. 303–307*).—Attempts to form sugar from fat by treating olive oil and oleic acid with sheep liver were not successful, but as the author notes the experiments reported do not preclude the possibility of such formation in the body.

The influence of fat in the diet on the renal excretion of ammonia, F. STEINITZ (*Zentbl. Inn. Med., 25 (1904), p. 81; abs. in Zentbl. Physiol., 18 (1904), No. 3, p. 85*).—It was noted that ammonia excretion increased with the amount of fat eaten while sodium and potassium excretion decreased. The experiments were made with children and the salt content of the diet was kept constant.

The dietetic value of the legumes, MARY L. VAN ZILE (*Iowa Agr., 4 (1904), No. 3, pp. 117, 118*).—A popular summary.

The influence of external hemorrhage on chemical changes in the organism, with particular reference to proteid catabolism, P. B. HAWK and W. J. GIES (*Amer. Jour. Physiol., 11 (1904), No. 3, pp. 171–236*).—The experiments reported were made with dogs. The elimination of nitrogen, phosphorus, chlorin, and sulphur was one of the questions studied.

The end products of self digestion of animal organs, I, P. A. LEVENE (*Ztschr. Physiol. Chem., 41 (1904), No. 5, pp. 393–403*).—A contribution to the subject of digestion and digestive ferments.

The final products of autodigestion of pancreas, III, KUTSCHER and LOHMANN (*Ztschr. Physiol. Chem., 41 (1904), No. 4, pp. 332–342*).—Experimental data are reported.

Calorimetric studies of feces, H. LOHRISCH (*Ztschr. Physiol. Chem., 41 (1904), No. 4, pp. 308–320*).—In the author's opinion, determining the heat of combustion of feces furnishes valuable data for judging of the utilization of different foods. Experimental data are reported, including the heat of combustion of the food, feces etc., in experiments with man.

The paths of excretion for inorganic compounds. I, The excretion of strontium, L. B. MENDEL and H. C. THACHER (*Amer. Jour. Physiol., 11 (1904), No. 1, pp. 5–16*).—The authors' conclusions drawn from the experiments reported follow: "Strontium salts are eliminated to a relatively small extent only by the kidneys, even after direct introduction into the circulation. The excretion in the urine begins soon, and ceases usually within 24 hours. The larger portion of the strontium eliminated is found in the feces, whether the introduction of the element be per os, subcutaneously, intravenously, or intraperitoneally.

"The place of excretion is apparently restricted to the region of the alimentary tract beyond the stomach. A functional relation to certain phenomena of intestinal peristalsis, etc., is suggested. The rate of elimination is slow, and is apparently influenced by the calcium content of the food. Strontium is found deposited in the body chiefly in the bones; traces may be met with in the liver and muscles."

Experiments on the physiological action of the active substances of organs and tissues, A. PUGLIESE (*Jour. Physiol. et Path. Gén., 6 (1904), No. 3, pp. 452–465, dgms. 12*).—Results of a number of experiments are reported.

The retarding of peptic activity by salts, J. SCHÜTZ (*Beitr. Chem. Physiol. u.*

Pathol., *5* (*1904*), *No. 9*, *pp. 406–411*).—From a number of experiments the conclusion was reached that anions hinder peptic digestion within wider limits than cations, sodium being generally the strongest of the cations. Other conclusions are also drawn which have to do with the subject considered from the standpoint of the theories of physical chemistry.

General relations between heat of combustion of organic compounds and their structural formulæ. Calculations of the heat of combustion, P. Lemoult (*Ann. Chim. et Phys.*, *8. ser.*, *1* (*1904*), *Apr.*, *pp. 496–553*).—A theoretical and mathematical discussion.

A note on pancreas-nucleoproteid, P. A. Levene and L. B. Stookey (*Ztschr. Physiol. Chem.*, *41* (*1904*), *No. 5*, *pp. 404–406*).—Analytical and other data are reported.

Concerning the history of the discovery of the relationship between chlorophyll and the coloring matter of the blood, L. Marchlewski (*Arch. Physiol.* [*Pflüger*], *102* (*1904*), *No. 1–2*, *pp. 111–115*).—A historical and controversial article.

Experiments on the behavior of liver cells, especially as regards physical-chemical relations, E. Petry (*Beitr. Chem. Physiol. u. Pathol.*, *5* (*1904*), *No. 5–6*, *pp. 245–275*).—The absorption of chlorin was especially studied with reference to the properties and behavior of liver cells.

Physical deterioration, its causes and the cure, Mrs. A. W. Smyth (*London: John Murray*, *1904*, *pp. 334*; *rev. in British Med. Jour.*, *1904*, *No. 2266*, *pp. 1317*, *1318*).—Among other topics the author discusses milk supplies and the effect of food upon the physical condition of children.

Food requirements of infants, Barbier (*Ann. Hyg. Pub. et Méd. Lég.*, *1904*, *Apr.*, *p. 379*; *abs. in Rev. Soc. Sci. Hyg. Aliment.*, *1* (*1904*), *No. 1*, *p. 90*).—The food requirements of infants are discussed and a formula quoted for calculating the needed quantity of milk.

Food requirements of new-born infants, V. Bué (*Presse Méd.*, *1904*, *Mar. 2*; *abs. in Rev. Soc. Sci. Hyg. Aliment.*, *1* (*1904*), *No. 1*, *pp. 88–90*).—A summary and discussion.

ANIMAL PRODUCTION.

Fodders and feeding stuffs, F. T. Shutt (*Canada Expt. Farms Rpts. 1903*, *pp. 134–144*).—Analyses are reported of oats, whole grain, kernels, and hulls; brans and shorts, molasses feeds, dried beet pulp, cotton-seed meal, mangel-wurzels, carrots, and turnips.

Handbook of animal feeding and feeding stuffs, E. Pott (*Handbuch der tierischen Ernährung und der landwirtschaftlichen Futtermittel. Berlin: Paul Parey*, *1904*; *vol. 1*, *pp. X+389*).—A second edition of this handbook which the author states has been thoroughly revised and now will appear in 2 volumes. The first volume takes up the general theories of nutrition; composition, feeding value, and valuation of feeding stuffs; effect of soil and other conditions of growth on feeding value, and related topics.

Report of the Louvain laboratory, J. Graftiau (*Rap. Trav. Lab. Anal. Louvain*, *1903*, *pp. 15*).—Analyses of a number of samples of fertilizers and feeding stuffs are reported, and data given regarding the work of the Louvain laboratory, including studies of the ash content of plants as affected by factory fumes.

Chemical analyses of meadow grasses, C. E. Bessey (*Breeder's Gaz.*, *45* (*1904*), *No. 25*, *pp. 1182*, *1183*).—An analysis of meadow hay is quoted.

Feed for domestic animals in Norway, H. Bordewich (*Dept. Com. and Labor, Mo. Consular Rpts.*, *75* (*1904*), *No. 283*, *p. 293*).—A brief note regarding the importation of American corn and cotton-seed meal into Norway, with suggestions for increasing the trade by proper methods of manufacture and packing.

Dried brewers' grains and distillers' grains, DIETRICH (*Landw. Vers. Stat., 58 (1903), No. 3-4, pp. 241-262, figs. 18*).—A number of forms of apparatus for drying brewers' and distillers' grains are described.

Oats, E. HASELHOFF and F. MACH (*Landw. Vers. Stat., 60 (1904), No. 3-4, pp. 161-206, pls. 2*).—Data regarding the composition, structure, and feeding value of oats and oat products and related topics are summarized and discussed.

Composition and food value of the leaves of sugar beets, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 8 (1904), No. 30, pp. 106-108*).—A summary of data on this topic.

The terminology of the constituents of feeding stuffs, A. GRÉGOIRE (*Bul. Cercle d'Études Agron. [Brussels], 1903, No. 8, pp. 369-375*).—The terminology proposed for the constituents of feeding stuffs is practically the same as that followed in the United States, Germany, and elsewhere.

The digestibility of peat as an absorbent for molasses in molasses feeds, T. PFEIFFER and A. EINECKE (*Mitt. Landw. Inst. Univ. Breslau, 2 (1904), No. 4, pp. 683-694*).—Experiments with sheep showed that an appreciable quantity of the total organic material, nitrogen-free extract, and pentosans of peat meal was digested. The author calls attention to the fact that molasses peat has more value than is ordinarily believed.

The digestibility of pentosans, S. WEISER (*Landw. Vers. Stat., 58 (1903), No. 3-4, pp. 238-240*).—Experiments are briefly reported on the digestibility of pentosans by steers, pigs, sheep, and a horse. The coefficients of digestibility varied within rather wide limits with the different animals and in different experiments with the same animals, but on an average this constituent was quite thoroughly digested. As shown by the experiments reported the digestibility of pentosans is parallel to and varies directly with that of carbohydrates.

The fate of pentosans (xylans) in the animal body, B. SLOVTZOV (*Izv. Imp. Akad. Nauk [Bul. Acad. Imp. Sci. St. Petersburg], 5. ser., 15 (1901), pp. 423-434; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 2, p. 157*).—From experiments with separated ferments and with guinea pigs, the conclusion was drawn that when xylan is consumed by herbivora in small quantities a portion at least is resorbed and serves as a nutrient. The digestive ferments did not act upon xylan, but hydrochloric acid changed some of it into xylose.

Concerning the resistance of true albumin to tryptic digestion in the animal body, S. ROSENBERG and C. OPPENHEIMER (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 9, pp. 412-421*).—From experiments with a dog with a fistula carried on in continuation of earlier work[a] the conclusion was reached that in the body as well as in vitro true albumin is resistant to the action of tryptic ferments.

Concerning the influence of alkalis on protein metabolism, E. DUFOURT (*Jour. Physiol. et Path. Gén., 6 (1904), No. 3, pp. 489-496*).—Experiments with dogs on a meat and on a vegetable diet are reported, the alkali studied being bicarbonate of soda in varying doses. According to the author the alkali increased the urea excretion as compared with the total renal nitrogen both on a vegetable and on a meat diet. The experiments are discussed at some length.

Sweet clover as a stock feed, G. H. OTIS (*Breeder's Gaz., 46 (1904), No. 2, p. 54*).—Contrary to the general opinion, the author on the basis of experience considers sweet clover hay a satisfactory feed for farm animals, including horses and mules; however, he recognizes the fact that it is necessary to first accustom them to its use. In his opinion it should be cut early and handled like alfalfa. The value of sweet clover for binding soil on washed-out and abandoned limestone lands is also spoken of.

On the distribution of osseomucoid, C. SEIFERT and W. J. GIES (*Amer. Jour. Physiol., 10 (1903), No. 3, pp. 146-148*).—Experiments with mammals, birds, reptiles,

[a] Beitr. Chem. Physiol. u. Pathol., 4 (1903), p. 279.

and a fish led to the conclusion that osseomucoid is very probably a normal constituent of all bones.

The reaction of the urine of Bovidæ, A. GOUIN and P. ANDOUARD (*Bul. Sta. Agron. Loire-Inférieure, 1902–3, pp. 101–105*).—Brief notes on the subject.

Animal feeding, A. STUTZER (*Fütterungslehre. Leipzig: Hugo Voigt, 1904; rev. in Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 6, pp. 492, 493*).—The fourth edition of this work, which is designed for the use of agricultural students, it is stated has been thoroughly revised.

Live stock, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1903, pp. 57–59*).—Brief statements are made regarding the cattle, sheep, swine, and horses at the Ottawa Experimental Farm.

Hybridism among birds, E. DÍAZ (*An. Acad. Cien., Habana, 38 (1902), pp. 231–233, pls. 2*).—The author presents 2 illustrations furnished by the owner of fowls claimed by the latter to be crosses between the turkey and guinea hen. Brief notes are given on the difficulties of obtaining crosses between different genera of domestic fowls and on the distinguishing characteristics of this particular cross.

On the relation of autolysis to proteid metabolism, H. G. WELLS (*Amer. Jour. Physiol., 11 (1904), No. 4, pp. 351–354*).—In the experiments reported it did not appear that extracts of thyroid, kidney, and spleen had any decided effect on the autolysis of the liver of the dog.

Changes in races of Bovidæ as related to the geological origin of soils, A. GOUIN (*Bul. Soc. Agr., Sci. et Arts, Sarthe, 2. ser., 31 (1904), No. 3, pp. 240–262*).—A theoretical discussion of the subject.

Experiment with steers, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1903, pp. 284, 287–294, 333–336, 392–394*).—The relative merits of feeding steers loose and tied in stalls were studied at the Maritime Provinces Farm with 2 lots of 8 dehorned steers, each fed similar rations of hay, roots, silage, and mixed meal for 150 days. The total gain made by the loose steers was 2,435 lbs. and by the tied steers 2,250 lbs.

In a comparison of full fattening and limited growing rations it was found that a lot of 5 calves on a full fattening ration made an average daily gain of 2.32 lbs. at a cost of 6 cts. per pound for 150 days. Similar values for 5 calves fed the limited growing ration for a year were 0.86 lb. and 5.30 cts. In a second test the steers fed the full fattening ration made an average daily gain of 1.44 lbs. at a cost of 5.21 cts. per pound, and with those on a limited growing ration the average daily gain was 0.95 lb. per steer and the cost of a pound of gain 3.64 cts. The above tests were made in continuation of those previously reported (E. S. R., 15, p. 172).

At the Manitoba Experimental Farm brome-grass hay was compared with corn fodder, using 2 lots of 5 steers each. The lots were all fed turnips, chopped mixed grains, and bran in addition to the coarse fodders mentioned, and were handled similarly. In the 32 weeks of the test the steers fed brome-grass hay made an average daily gain of 1 lb. 10 oz. and those fed corn fodder 1 lb. 12 oz. According to the authors' calculations the profits were, respectively, 64 and 71 cts. per steer in the 2 lots.

"There is very little profit in feeding steers when the difference between the buying and selling price is only about 75 cts. per steer. Cattle require more pounds of fodder corn per day than they do of brome-grass hay. The comparative value of these 2 fodder crops is about $4 per ton for fodder corn and $5 for brome hay."

The gains made by steers turned out 2 hours each day, as compared with those kept continually in the stable, were studied at the Indian Head Farm with 2 lots of 5 animals each fed under uniform conditions. In the case of the steers turned out a part of each day the total gain in the 180 days of the test was 1,520 lbs. and the calculated profit per steer $2.14 as compared with 1,615 lbs. and $2.74 for the steers confined all the time.

In connection with the experiments brief notes are given regarding the cattle kept at the several experimental farms.

Cattle: Beef production, J. H. Grisdale (*Canada Expt. Farms Rpts. 1903, pp. 57, 58, 67–79*).—The station herd is briefly described and feeding tests are reported in continuation of earlier work (E. S. R., 15, p. 172). In a study of the relative merits of handling steers, 9 animals tied in stalls and having an average of 56 sq. ft. of space per steer gained 1.58 lbs. per head per day, the cost of a pound of gain being 7.05 cts. The test covered 180 days.

In the case of a similar lot of loose steers with an average of 84 sq. ft. of space per steer the average daily gain per head was 1.87 lbs., the cost of a pound of gain being 5.32 cts., while 9 loose steers having 38 sq. ft. of space per steer made an average daily gain of 1.52 lbs. per steer, the cost of a pound of gain being 6.58 cts. The steers in the last two mentioned lots were dehorned. All were fed a ration of gluten meal, silage, roots, and hay.

In a study of the influence of age on the cost of beef production it was found that a lot of 9 3-year-old steers in 180 days made an average daily gain of 1.58 lbs., the cost of a pound of gain being 7.05 cts. Similar values in the case of 9 2-year-old steers were 1.65 lbs. and 6.03 cts., with a lot of 9 yearlings 1.65 lbs. and 5.54 cts., with a lot of 6 calves 6 months old 1.46 lbs. and 5.33 cts., and with a lot of 6 new-born skim-milk calves 1.48 lbs. and 2.16 cts.

In every case the coarse food consists of roots, silage, fodder, and hay. The steers and yearlings were fed gluten meal in addition and the calves a grain ration made up of different proportions of oats, peas, barley, oil meal, and gluten meal. The new-born calves were also given some skim milk. "In cost of production there is a quite remarkable gradation in favor of the younger classes."

In a comparison of feeding heavy rations from birth to block and feeding in the usual way, that is, a limited growing ration for the first 5 or 6 months and then a fattening ration until the time of slaughtering, it was found that 6 steers fed a full fattening ration gained 1.18 lbs. per head per day for 365 days, the cost of a pound of gain being 6.13 cts. An equal number of steers fed the same length of time the limited growing ration gained 0.96 lb. per day, the cost of a pound of gain being 6.22 cts. Five calves fed a full fattening ration for 184 days made an average daily gain of 1.48 lbs. at a cost of 2.16 cts. per pound.

Beef cattle breeding in Argentina, F. W. Bicknel (*Breeder's Gaz., 46 (1904), Nos. 5, pp. 166–168; 6, pp. 208, 209, figs. 8*).—The extent and condition of the cattle industry in Argentina are discussed.

To estimate the weight of cattle by measuring with a tape line, R. West (*Jour. Jamaica Agr. Soc., 8 (1904), No. 7, p. 285*).—Brief directions are given for estimating the weight of cattle from external measurements.

Calf-rearing experiments, second year, 1902 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 3. pp. 415–427, dgms. 2*).—In continuation of earlier work (E. S. R., 15, p. 802) the possibility of rearing calves on cream substitutes was studied with 3 lots of 9 and 1 lot of 8 calves under practically the same conditions as in the earlier test. For 20 weeks lot 1 received a whole milk ration, lot 2 a mixture of whole and skim milk, lot 3 skim milk with the addition of cod-liver oil, and lot 4 skim milk with a mixture of meals. The greatest gain, 291.5 lbs., per head was made on the whole milk and the least gain, 244.1 lbs., on skim milk and cod-liver oil.

The test was continued under uniform conditions after weaning to judge of the effect of the rations mentioned on subsequent gains. Considering the whole period, which covered 73 weeks, the greatest gain, 625.9 lbs., per head was made on whole milk and the smallest gain, 531.8 lbs., per head on a mixture of whole and skim milk. The whole milk ration was the most expensive. The greatest saving by using whole milk substitutes amounted to \$5.28 per head and was noted with the ration composed of a mixture of whole and skim milk.

From this and the earlier experiments the conclusion was drawn that "although calves fed for a long period on whole milk will show a high rate of increase when compared with the gain in weight made by animals reared on other foods, the increase is not proportional to the cost incurred. It is much more economical to use a cream substitute, such as linseed cake, with cod-liver oil, Indian meal, or a mixture of meals, along with separated milk than to use whole milk and linseed cake."

New experiments on the feeding of calves, A. GOUIN and P. ANDOUARD (*Bul. Sta. Agron. Loire-Inférieure, 1902–3, pp. 66–100*).—In continuation of work previously reported (E. S. R., 14, p. 1105), the author studied the water content of flesh, and the effect of acid potassium phosphate, dried calcium phosphate (the natural mineral), powdered green bone, arsenite of potash, hydrochloric acid, and bicarbonate of soda upon the assimilation of food, the metabolism of nitrogen, and the gains made by calves.

His previous deduction as to the value of powdered bone in inducing gains was confirmed. The conclusion was reached that calves require smaller amounts than the Wolff standard calls for; for instance, during 98 days one of the calves consumed 1,947 gm. of dry matter and digested 1,245 gm., the gain made amounting to 852 gm., as compared with 1,740 gm. digestible nutrients, and 550 gm. gain, called for by the German standards.

Depreciation of leather by brands, J. MEHMKEN (*Breeder's Gaz., 46 (1904), No. 4, p. 130, dgm. 1*).—The author discusses the effect of branding upon the value of the dressed hide and points out that the least injury results when branding is done on the jaw. The most damage is caused by the side brand, the hip brand being regarded as between the two in this respect.

The sheep industry of the Laramie Plains, F. S. KING (*Ranchman's Reminder, 1 (1904), No. 7, pp. 83–87, figs. 4*).—The early history of the local sheep industry is briefly spoken of.

Sheep, R. ROBERTSON (*Canada Expt. Farms Rpts. 1903, p. 295*).—Brief notes are given regarding the Maritime Provinces Farm flock.

Swine, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1903, pp. 294, 295, 336, 337, 394*).—In continuation of tests previously reported (E. S. R., 15, p. 174) the relative merits of pasturing pigs and feeding in pens was tested at the Maritime Provinces Farm with 2 lots of 10 animals each. The lot pastured for 4 months and then fed in a pen for 1 month made an average daily gain of 1.06 lbs. per head, at a cost of 3.04 cts. per pound, as compared with 0.8 lb. and 4.05 cts. in the case of the lot fed in the pens for the entire period.

At the Manitoba Experimental Farm 4 pigs fed spelt gained 389 lbs. as compared with 407 lbs. in the case of a similar lot fed mixed grain, the calculated profit in the two cases being \$8.99 and \$9.75. "The pen of animals fed on mixed grain consumed 25 lbs. more grain during the fattening period than those fed on spelt."

In addition to the feeding tests brief notes are given regarding the swine kept at the Maritime Provinces, Manitoba, and Indian Head experimental farms.

Millet for fattening swine, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 83, pp. 15, figs. 5*).—Using 3 lots of 2 pigs each the relative value of ground barley, hog millet (*Panicum miliaceum*), and wheat was studied. These grains were mixed with water and fed ad libitum. In the 84 days of the test the average daily gain per head on barley was 1.25 lbs., the feed eaten per pound of gain being 4.95 lbs. Similar values for millet were 1.13 lbs. and 5.95 lbs., and for wheat 1.67 lbs. and 4.87 lbs. It was noticed that the lot receiving millet relished their feed and were in apparently as good physical condition during the whole test as the other lots.

Considering the test as a whole the authors calculate that the barley and millet each returned 41 cts. and the wheat 52 cts. per bushel. An examination of similar cuts from the dressed carcasses showed that the percentage of fat to lean in the mil-

let-fed pork was much smaller than in the other samples. All the pork was considered too fat for local trade and the authors believe that the pigs might have been more advantageously slaughtered earlier.

The lean meat from the lots fed millet and wheat was lighter in color than that from the barley-fed lot. The fat from the lot fed millet was pure white and although not so firm in texture it was considered superior in quality to that of the other carcasses, which had a yellowish tinge. An analysis of the millet fed is reported.

The utilization of skimmed milk in feeding pigs, H. H. WING (*New York Cornell Sta. Bul. 220, pp. 189–197*).—Skim milk is frequently sold for the manufacture of casein and similar purposes, returning to the producer not over 10 cts. per 100 lbs. A test was therefore undertaken with 6 lots containing from 7 to 12 pigs each, to see if it could not be more profitably utilized as a feeding stuff.

In addition to skim milk lots 1 and 3 were fed corn meal, lots 2 and 5 corn meal and gluten feed 1:1, and lots 4 and 6 corn meal and wheat middlings 1:1. Considering the results as a whole the average daily gain for the 83 days of the test was 0.99 lb. on corn meal, 0.93 lb. on corn meal and gluten feed, and 0.96 lb. on corn meal and wheat middlings, the skim milk fed per pound of gain averaging 3.5, 4.3, and 4.7 lbs. in the 3 cases.

From the results of the trial the author calculates that on the whole skim milk is worth about 15 cts. per cwt. when fed to pigs from the time of weaning until they weigh about 125 lbs.

"Clear corn meal is perfectly satisfactory as a single grain when fed in connection with skimmed milk.

"Weanling pigs in close quarters during cold weather can be made to gain a pound live weight per day for 3 months.

"There are indications that the proportion of skimmed milk can be increased economically above the ratio of 3 lbs. of milk to 1 lb. of grain usually recommended, thus lessening the amount of grain food that must be purchased."

Poland-China and Berkshire pigs, F. L. CLARKE (*Jour. Jamaica Agr. Soc., 8 (1904), No. 7, pp. 275, 276*).—The author discusses pig breeding under local conditions and gives briefly the results of his experience with Poland-China and Berkshire pigs.

Horses, R. ROBERTSON and A. MACKAY (*Canada Expt. Farms Rpts. 1903, pp. 284, 304*).—Brief statements are made regarding the horses kept at the Maritime Provinces and Indian Head experimental farms.

The horse industry in Australia, W. G. MCKINNEY (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 5, pp. 321–334*).—A descriptive and statistical article.

Results of scientific feeding of plantation mules, W. GODCHAUX (*Proc. Louisiana State Agr. Soc. and Stockbreeders' Assoc., 1904, pp. 71–79*).—The rational feeding of mules is discussed and data given regarding the system at present followed at a large sugar factory at Assumption Parish, Louisiana, as compared with the system previously followed.

The ration now fed consists of 8 lbs. of corn-and-cob meal, 2 lbs. cotton-seed meal, 11 lbs. molasses, and 15 lbs. pea-vine hay, the cost being 14.5 cts. per head. According to the author's calculations this would supply the nutrients and energy called for by Wolff's standard for horses or mules at heavy work. The author states that the use of this ration has diminished the cost of feeding mules nearly half, while at the same time their health has improved.

Cuba's beasts of burden, F. C. GILTNER (*Breeder's Gaz., 46 (1904), No. 3, pp. 88–90, figs. 8*).—The author describes the horses, mules, and cattle used as beasts of burden in Havana and the rural districts of Cuba.

Report of the poultry manager, A. G. GILBERT (*Canada Expt. Farms Rpts. 1903, pp. 239–255, pl. 1*).—The important factors in the production of a superior quality of

poultry, breeds and strains, the local price for eggs, and other conditions affecting poultry raising are spoken of, and brief notes are given regarding the experimental work of the poultry department, the rations fed, and the results of incubator tests, as well as data regarding the number of eggs laid during the year and the stock kept at the station poultry farm. The information gained in connection with testing and hatching eggs laid during the cold season is summarized as follows:

"The generous and gently stimulating rations given to the fowls kept in cold houses did not seem to affect the strength of the germs of the eggs laid by them, as similar rations apparently did in the case of the hens kept in artificially warmed quarters.

"Eggs laid in early December by the hens in artificially warmed houses showed a greater percentage of strong germs than did eggs laid by them later in the season.

"Eggs laid by the same hens in early spring showed a satisfactory percentage of fertility, but the weakest germs.

"The most striking and gratifying results were obtained from the fowls which, like their parent stock, had never known warm quarters. From 55 eggs laid by these fowls in early spring—after laying well during the winter—48 strong chickens were hatched. In contrast with this are 17 chickens from 52 eggs laid by hens kept in warmed but comparatively limited quarters.

"Results were strongly in favor of the average farm conditions."

Poultry, R. Robertson, S. A. Bedford, and A. Mackay (*Canada Expt. Farms Rpts. 1903, pp. 296, 337, 338, 394*).—At the Manitoba farm 4 Barred Plymouth Rock cockrels fed in pens a mixture of equal parts of finely ground wheat, barley, and oats, mixed to a thin porridge with skim milk, gained 5 lbs. 8 oz. in 28 days, the cost of a pound of live weight being 4 cts. Four Wyandotte cockrels fed the same ration under the same conditions gained 4 lbs., the cost of a pound of live weight being 5.25 cts.

Brief statements are also made regarding the work of the poultry department at the Maritime Provinces, Manitoba, and Indian Head experimental farms.

The poultry industry (*Maine Dept. Agr. Bul., 3 (1904), No. 2, pp. 55–81*).—This bulletin includes popular articles which have to do with poultry raising and data regarding the present condition of the poultry industry in Maine.

A representative English poultry plant (*Reliable Poultry Jour., 11 (1904), No. 6, pp. 631–635, figs. 5*).—A descriptive article which discusses among other topics the sale of day-old chicks and so-called live eggs—that is, incubated eggs—which examination has shown contain live chickens within 3 days of hatching.

Experiments in chicken fattening, F. T. Shutt (*Canada Expt. Farms Rpts. 1903, pp. 256–260*).—The relative merits of fattening chickens in pens and crates was studied with 4 lots of 6 chickens each. In the case of the 2 lots fed in pens the average gain per chicken in the 4 weeks covered by the test was 1 lb. 9.33 oz. and 2 lbs. 4.5 oz., the cost of a pound of gain being 6.7 cts. and 5.3 cts., respectively.

In the case of the lots fed in crates the average gain per chicken was 1 lb. 9.66 oz. and 2 lbs. 2.33 oz., the cost of a pound of gain being 6.2 cts. and 5.6 cts. The proportion of edible and nonedible portions in the dressed chickens was recorded in both cases, the proportion of dressed carcass being the larger in the case of the chickens fed in crates, while the flesh of the pen-fed birds, it is stated, was slightly the yellower.

The results of the present test, it is noted, are apparently contradictory to those previously obtained (E. S. R., 15, p. 176). "It is possible that the more favorable temperature for the crated birds this season was the predominating factor in altering the relative economy of the two systems of feeding. The question of temperature appears to be one well worthy of further investigation."

The relative value of all grain and grain-and-meat rations was studied with 2 lots each containing 5 Barred Plymouth Rock cockrels, the ration of the former lot being

made up of ground oats and barley 4:3 fed with skim milk, and that of the latter ground oats, barley, and meat meal 4:3:1. In the 4 weeks of the test the average gain per chicken on the grain ration was 1 lb. 13.5 oz. and the cost of feed per pound of gain 5.4 cts. Similar values for the grain-and-meat ration were 2 lbs. 0.6 oz. and 5.6 cts.

"These results show an increased efficiency for the ration containing the meat scrap. When, however, the relative cost of the ration is taken into account, the 'all grain' has slightly the advantage (by reason of it costing less), the difference being two-tenths of a cent per lb. of increase more in the case of the 'grain and meat' ration.

"On killing and dressing, the two lots were found to be remarkably similar as regards plumpness and weight, due largely, the writer thinks, to the uniformity of type. They furnished identical data as regards the percentage of dressed carcass, and were only distinguished into groups by the slightly yellow tinge of the 'all-grain' fed birds; the chickens from the 'grain and meat' ration gave a perfectly white flesh."

Growth of chickens and cost of rearing, E., E. T., and W. Brown (*Reprinted from Poultry, 1904, July 22, pp. 4*).—At the Reading University College Poultry Farm the comparative merits of White Wyandottes and crossbreeds were tested under uniform conditions. White Wyandottes made an average gain of 2.17 lbs. and the crossbreeds of 2.26 lbs. in 12 weeks, the cost of a pound of gain in the 2 cases being 6.96 cts. as compared with 6.68 cts. The crossbred birds were at a disadvantage, in the authors' opinion, in that 3 different crosses were used. The Faverolles-Buff Orpington was the most profitable. The quality of the flesh of the dressed birds is briefly discussed.

It is evident, according to the authors, "that the larger profit is obtained in producing market chickens by breeding from the table varieties of poultry. Further, they must be salable at the right season, when prices for spring chickens are good."

Laying competitions, B. W. Horne (*Jour. British Dairy Farmers' Assoc., 17 (1902), pp. 40-49*).—The importance of laying competitions is briefly spoken of and data regarding those carried on under the auspices of the Utility Poultry Club are given.

Turkeys: Standard varieties and management, T. F. McGrew (*U. S. Dept. Agr., Farmers' Bul. 200, pp. 40, figs. 12*).—Among the questions discussed are the present condition of the turkey industry; standard varieties of turkeys; selection and treatment of breeding stock; egg laying, incubation, and hatching; care of young turkeys; feeding stock turkeys and feeding for market, marketing, parasites, and diseases.

"It should never be forgotten that in the wild state their food was the bugs, worms, seeds, etc., which they could find for themselves, and which were hunted for and scrambled after continually. There was then no overfeeding upon rich unnatural foods that impaired health and produced bowel troubles or other ailments that naturally follow unwholesome food. They subsisted by their own efforts in the wild state, while now they are quite too often forced to eat unnatural foods that are furnished in hope of forcing them to an unnatural growth."

Wet or sloppy foods are not recommended for young turkeys.

"Food should be given . . . [young turkeys] quite early in the morning and at frequent intervals during the day. Never overfeed them, but use discretion in providing plentifully for their necessities. Give them all they will eat willingly and no more. Avoid the use of rich foods, grains in hulls, and millet seed, which is not good for them while they are young; a little of this seed, however, may be fed as they grow older. Too much hard-boiled egg is bad for them, while a reasonable amount of bread is beneficial.

"Coarse sand is excellent for grit, and if sufficient of this is at hand no other grit will be needed; but plenty of grit of some kind is a necessity, for without it the poults can not grind their food."

Saturated limewater for the preservation of eggs, F. T. SHUTT (*Canada Expt. Farms Rpts. 1903, p. 261*).—Brief directions for the preservation of eggs in limewater, a method which the author states in his experience has proved more satisfactory than the use of water glass.

A new method of preserving eggs in use in Great Britain, L. IRWELL (*Dietet. and Hyg. Gaz., 20 (1904), No. 8, pp. 457, 458*).—The use of water glass for preserving eggs is described.

A cheap tick-proof fowl house for farmers, A. A. BROWN (*Jour. Dept. Agr. Victoria, 2 (1904), No. 8, pp. 757–760, figs. 7*).—Detailed directions are given for the construction of a hen house in such a manner as to prevent infestation from ticks either upon the roosts or nests.

DAIRY FARMING—DAIRYING.

Alfalfa hay, cowpea hay, and soy-bean silage as substitutes for purchased feeds; cotton-seed meal v. wheat bran and dried brewers' grains, C. B. LANE (*New Jersey Stas. Bul. 174, pp. 24*).—Home-grown products were compared with purchased feeds in 3 feeding experiments with cows. Each experiment included 4 cows and covered 2 periods of 15 days, the third experiment being duplicated. Tabulated data are given showing the yield and composition of milk and the cost of production.

In the first experiment a ration consisting of 17 lbs. of cowpea hay and 36 lbs. of corn silage, and containing 3.6 lbs. of protein with a nutritive ratio of 1:6, was compared with a ration consisting of 4 lbs. of wheat bran, 3 lbs. of dried brewers' grains, 2 lbs. of cotton-seed meal, 5 lbs. of cornstalks, and 36 lbs. of corn silage and containing 3.2 lbs. of protein with a nutritive ratio of 1:5.

The average daily yield per cow was 23.7 lbs. of milk, containing 3.86 per cent of fat, on the cowpea-hay ration, and 25.7 lbs. of milk, containing 4.11 per cent of fat, on the feed ration. The feed ration produced 8.3 per cent more milk and 15.2 per cent more butter than the cowpea-hay ration. The cost of producing 100 lbs. of milk and 1 lb. of butter was, respectively, 39.8 and 8.82 cts. when the cowpea-hay ration was fed, and 60.5 and 12.6 cts. when the other ration was fed.

The increased yield from feeding grain was not sufficient in this experiment to pay for the additional cost of the ration. Applying these results to a herd of 30 cows it is estimated that the gain from feeding the cowpea-hay ration would amount to $37.20 per month. "However, it is believed that a combination of coarse and fine feeds is necessary to produce the best results."

In the second experiment the home-grown ration consisted of 36 lbs. of soy-bean silage, 8 lbs. of alfalfa hay, and 6 lbs. of corn meal, and contained 3.64 lbs. of protein with a nutritive ratio of 1:5; and the feed ration consisted of 4 lbs. of wheat bran, 4 lbs. of dried brewers' grains, 2 lbs. of cotton-seed meal, 6 lbs. of cornstalks, and 36 lbs. of corn silage, and contained 3.45 lbs. of protein with a nutritive ratio of 1:6.

The average daily yield per cow was 27.2 lbs. of milk, containing 3.60 per cent of fat, on the home-grown ration, and on the purchased ration 25.7 lbs. of milk, containing 3.80 per cent of fat. The yield of milk on the home-grown ration was 5.81 per cent greater than that on the purchased ration, while there was practically no difference in the yield of butter.

These results are believed to show that it is practicable, from the standpoint of milk and butter production, to grow the entire ration upon the farm. At market prices the cost of producing 100 lbs. of milk and 1 lb. of butter on the home-grown ration was, respectively, 56.5 and 13.5 cts., and on the purchased ration, 65 and 14.6 cts., showing a considerable saving in the cost of milk and butter production when home-grown feeding stuffs were used.

In the third experiment a ration consisting of 4.5 lbs. of cotton-seed meal, 36 lbs. of corn silage, and 6 lbs. of cornstalks, and containing 2.97 lbs. of protein with a

nutritive ratio of 1:5.1, was compared with a ration consisting of 5 lbs. of wheat bran, 5 lbs. of dried brewers' grains, 36 lbs. of corn silage, and 6 lbs. of cornstalks, and containing 2.94 lbs. of protein with a nutritive ratio of 1:6.7.

The results of the 2 tests with 2 different lots of cows showed an average daily yield per cow of 22.7 lbs. of milk, containing 4.23 per cent of fat, on the cotton-seed meal ration; and 23.9 lbs. of milk, containing 3.98 per cent of fat, on the contrasted ration. While the yield of milk and butter was practically the same on the 2 rations, the cost of production was 54.1 cts. for 100 lbs. of milk and 11 cts. for 1 lb. of butter on the cotton-seed meal ration, as compared with 66 and 14.3 cts., respectively, on the contrasted ration. Applying these results to a herd of 30 cows, the gain per month from feeding cotton-seed meal, as compared with the bran and brewers' grains, would amount to $42.60. When cotton-seed meal is thoroughly mixed with corn silage or other starchy foods it is believed that it can be fed to the extent of 4.5 lbs. daily per cow without injurious effects.

Feeding dairy cows, W. J. Fraser (*Illinois Sta. Circ. 75, pp. 18*).—This circular treats in a popular manner of the nutrients in feeding stuffs, and the calculation of rations for dairy cows.

Dairy herd records, J. H. Grisdale and R. Robertson (*Canada Expt. Farms Rpts. 1903, pp. 59–67, 284–286, pl. 1*).—Detailed and summarized records are given of 38 cows of different breeds at the Central Experimental Farm, and of 20 cows at the Experimental Farm for the Maritime Provinces. Notes are also given on the feeding of the cows.

Improvement of dairy herds, H. A. Hopper (*Illinois Sta. Circ. 76, pp. 15, figs. 3, dgm. 1*).—This circular emphasizes the necessity of testing cows as a means of improving dairy herds. Directions are given for making tests and keeping records. Records of 2 cows are given for the purpose of illustrating the calculation of the yield of fat and the determination of the profit or loss. Brief notes are also given on the improvement of the herd by breeding and selection.

The effect of drinking water on milk secretions, Koch (*Jahresber. Pharm., 36; abs. in Wchnschr. Tierheilk. u. Viehzucht, 47 (1903), No. 29; Ztschr. Fleisch- und Milchhyg., 14 (1904), No. 8, p. 278*).

The transformation of food fat into milk fat, S. Gogitidse (*Ztschr. Biol., 45 (1904), No. 4, pp. 353–371, dgms. 2*).

The protein content of mother's milk, E. Meyer (*Dissertation, Berlin, 1902; abs. in Ztschr. Diätet. u. Phys. Ther., 7 (1903), No. 12, p. 697*).

Additional work upon the associative action of bacteria in the souring of milk and in other milk fermentations, C. E. Marshall (*Michigan Sta. Spec. Bul. 29, pp. 7*).—In an earlier article (E. S. R., 15, p. 1113) the author reported the results of experiments which showed that a micro-organism capable of peptonizing casein and rendering milk alkaline, materially hastened the curdling of milk when inoculated with a species of lactic-acid bacteria. Further experiments with these two micro-organisms, designated respectively micro-organism B and micro-organism A, are reported in this bulletin. Other species have also been found which hasten the curdling of milk, and still others which retard the process.

So far as the investigations have gone, the group which hastens curdling seems to predominate. Micro-organism B was found to die out within 50 hours when associated with the lactic-acid bacteria. The stimulating influence of this micro-organism was, therefore, exerted early in the process of development. To determine the nature of this stimulating influence micro-organism B was cultivated in milk for 48 hours, when the culture was sterilized. It was found that the products of micro-organism B were unchanged by sterilization and were as active in stimulating the lactic-acid bacteria as the living organisms themselves. Whey-agar made from a milk culture of micro-organism B was much more favorable to the growth of micro-organism A than whey-agar made from fresh milk.

In further experiments 100 cc. of milk was placed in each of 8 flasks, which were then sterilized on 3 consecutive days. Four of the flasks were inoculated with the same quantities of micro-organism B, and after 48 hours were again sterilized. The 8 flasks were then inoculated with a culture of micro-organism A, great care being taken to secure practically the same number of micro-organisms in each flask. The 4 flasks which had been inoculated with micro-organism B gave very uniform results, as did also the 4 flasks not inoculated with this micro-organism. Between the 2 sets, however, there was marked variation. The acidity developed much more rapidly in the first instance. At the end of 24 hours the number of bacteria in the flasks without the influence of micro-organism B was 12,920,000 per cubic centimeter, and in the flasks previously inoculated with micro-organism B, 517,920,000.

Micro-organism B, therefore, exerts an influence upon the development of micro-organism A as is shown by the visible changes brought about in the milk, by a study of the development of acid, and by determinations of the number of bacteria present. The results indicated that this influence is due to the products of micro-organism B. The work is believed to have a direct bearing on the subject of pure-milk supply, and is to be continued.

The cream separator on western farms, E. H. Webster and C. E. Gray (*U. S. Dept. Agr., Farmers' Bul. 201, pp. 24*).—This is condensed from Bulletin 59 of the Bureau of Animal Industry, previously noted (E. S. R., 16, p. 194).

The cream-gathering creamery, H. H. Dean and J. A. McFeeters (*Ontario Agr. Col. and Expt. Farm Bul. 135, pp. 12*).—This is a popular bulletin discussing and making suggestions on the selection and feeding of cows, creaming of milk, cream testing, delivering cream, oil tests, pasteurization, churning, and creamery building and machinery.

VETERINARY SCIENCE AND PRACTICE.

Report of the colonial veterinary surgeon for 1902 (*Cape Town: Govt. Printer, 1903; pp. 28*).—An outbreak of rinderpest occurred in Basutoland for the first time in 2 years. Attention is called to the necessity of thorough destruction of all centers of infection for this disease. Both bile and serum are used in preventive inoculation against the disease in Cape Colony. The chief advantage in favor of bile is the fact that it can be prepared with less skill and more quickly than serum. Serum is more effective, however, and cheaper. Notes are also given on pleuro-pneumonia, tuberculosis, inspection of dairies and abattoirs. Reports from the assistant veterinary surgeons are also presented.

Abattoirs and meat inspection in Holland, Kühnau (*Berlin. Tierärztl. Wchnschr., 1904, No. 37, pp. 625–630*).—The organization and execution of meat inspection in Holland are briefly described with notes on their different abattoirs. Statistics are presented on the number of animals inspected and on the precentage of animals found to be affected with tuberculosis, trichina, and other diseases.

Diseases of domestic animals (*Japan in the Beginning of the 20th Century. Tokyo: Imperial Japanese Commission to the Louisiana Purchase Exposition, 1904, pp. 196–199*).—A brief review is presented of the origin of animal diseases in Japan with especial reference to cattle plague, anthrax, glanders, black leg, pseudo-farcy, foot-and-mouth disease, and rabies. The status of veterinary practice is also briefly discussed.

A brief report of veterinary literature concerning wounds for the year 1901-2, E. Bass (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 37, pp. 368–371*).—The literature of this subject is critically discussed in connection with a bibliography of 51 titles.

A brief report on the most important Italian literature in the field of general pathology and pathological anatomy for the year 1903, O. Barbacci (*Centbl. Allg. Path. u. Path. Anat., 15 (1904), No. 16–17, pp. 671–713*).—This report

contains a brief review of a large number of Italian books, pamphlets, and periodical articles on general pathology classified in 17 sections according to the parts of the body affected by different diseases.

Does the virus of ovine contagious agalactia pass through filters? A. CELLI and D. DE BLASI (*Clin. Vet., 27 (1904), No. 22, pp. 129–133*).—A series of inoculation tests with the virus of this disease as obtained from sheep and goats convinced the authors that the virus retains its virulence after being passed through filters.

Internal mycoses, E. BODIN and P. SAVOURÉ (*Arch. Parasit., 8 (1904), No. 1, pp. 110–136, figs. 9*).—Series of inoculations were made in experimental animals with *Rhizomucor parasiticus, Rhizopus equinus, Mucor corymbifer, Aspergillus fumigatus, A. niger*, and *Sterigmatocystis pseudonigra*. After inoculation the blood, peritoneal fluid, and various organs were examined for the purpose of detecting any hyperleucocytosis or other effect of the fungus organisms.

It was found that when fungus spores were inoculated into guinea pigs, the leucocytes surrounded the spores and entirely destroyed them in the case of nonpathogenic species, while in pathogenic species the spores produce local alterations when arrested in passing through the capillaries. Pathogenic spores, although surrounded by phagocytes, are not digested but remain intact and finally germinate. The digestion of nonpathogenic spores takes place in the macrophages or endothelial cells. Immunity toward infection with mold fungi therefore depends on destruction of the spores by macrophages. In these cases the theory of Metchnikoff seems to be sustained.

Mycoses in the respiratory passages, P. LESAGE (*Arch. Parasit., 8 (1904), No. 3, pp. 353–443, figs. 14*).—A long series of observations and experiments were made to determine the moisture content of respired air in man and animals, and the effect of contact with the walls of the respiratory passages on the germination of fungus spores, particularly *Sterigmatocystis nigra*.

It was found that spores placed on the tracheal or bronchial walls of birds or man either do not germinate at all or more slowly than in air saturated with water vapor and at the body temperature. The normal hygrometric conditions of the respiratory passages appear to have a marked effect on the germination of spores, and this fact must be considered in a study of mycoses in animals or man.

Rats, mice, and their parasites in their relation to the distribution of bubonic plague, C. TIRABOSCHI (*Arch. Parasit., 8 (1904), No. 2, pp. 161–349, figs. 72*).—A general account is presented of the rats and mice of Italy, with notes on the species and their distribution. Descriptive biological and economic notes are also given on the numerous species of fleas, lice, and mites which are known to live as parasites on rats and mice. The evidence regarding the agency of these parasites in carrying plague is not conclusive in any case.

A new saccharomycosis in rabbits, H. ROGER and P. E. WEIL (*Arch. Méd. Expér. et Anat. Path., Paris, 16 (1904), No. 2, pp. 145–162, pls. 2, fig. 1*).—During the course of the authors' experiments, 31 rabbits were inoculated with cultures of *Saccharomyces linguæ pilosæ*. The lesions thus produced varied according to the method of inoculation. The chief alterations were in the kidneys, while the liver was affected in only a part of the cases. It was found possible to immunize rabbits by vaccinating them with the fluid in which the yeast fungus was grown. The organism is easily removed by filtration on account of its large size.

Concerning metabolism in convalescing animals, SCHWENKE (*Arch. Exper. Path. u. Pharmakol., 48 (1902), p. 170; abs. in Ztschr. Diätet. u. Phys. Ther., 7 (1904), No. 9, p. 516*).—Experiments with dogs are reported and discussed.

Further studies on dourine, J. MAREK (*Ztschr. Thiermed., 8 (1904), Nos. 1–2, pp. 11–23; 3–4, pp. 161–178, figs. 3*).—Detailed notes are furnished on the histological structure of lesions of this disease in various tissues, such as the intervertebral ganglia, extraspinal tissues of the spinal nerves, muscles, and sexual organs.

In nearly all affected muscle tissue there were groups of round cells embracing the blood vessels. The peripheral nerves were affected with cellular infiltration and disintegration or disappearance of the nerve fibrils. Cellular infiltration was observed also in the spinal cord and other parts of the nervous system. The intraspinal motor nerve roots, with the exception of the first sacral nerve, showed no fibrillar degeneration. The sensory roots, however, showed pronounced degeneration. Cell infiltration was observed in the dura mater surrounding the proximal portion of both the motor and sensory roots.

Laryngo-tracheobronchitis and its complications, I. N. POTAPENKO (*Arch. Vet. Nauk., St. Petersburg, 34 (1904), No. 5, pp. 381–419*).—Clinical notes are given on the history of numerous cases of this disease in horses. Data are presented also to assist in rendering a differential diagnosis between this and other related diseases.

Vaccination of herbivora for rabies, P. REMLINGER and M. EFFENDI (*Rec. Méd. Vét., 81 (1904), No. 9, pp. 289–298*).—In 1903 12 cattle and 10 buffalo were vaccinated with poor results, 63 per cent of the animals dying of rabies. Detailed notes are given on these cases and also on the vaccination of 8 horses with a loss of 62 per cent as a result. The authors believe that vaccination should be repeated frequently as in man. The intravenous method is also suggested in order to obtain more satisfactory results.

Experimental cirrhosis of the liver, WERA DANTSCHAKOFF-GRIGOREVSKY (*Centbl. Allg. Path. u. Path. Anat., 15 (1904), No. 16–17, pp. 667–670, figs. 2*).—Cirrhosis of the liver was artificially produced in rabbits by a systematic inoculation of cultures of staphylococci. The cultures selected for this purpose were of low virulence, and the rabbits received from 1 to 2 cc. for their first injection. Each experimental animal received from 30 to 105 cc. in all. The pathological changes produced in the rabbits were similar in all cases. A detailed description is given of these changes both as regards the external appearance of the liver and the microscopic character of the affected liver tissue.

Preliminary report on the international tuberculosis conference at Copenhagen, May 26–29, 1904 (*Tuberculosis, 3 (1904), No. 8, Sup., pp. 162*).—The papers read at this conference are presented in a slightly condensed form, in German, French, and English. The problems discussed involved all of the various aspects of tuberculosis of animals and man with especial reference to the legal, sanitary, and curative measures which have recently been recommended and tested in controlling this disease.

A lesson in bovine tuberculosis, H. L. RUSSELL (*Wisconsin Sta. Bul. 114, pp. 8, fig. 1*).—Attention is called to the extensive and insidious spread of tuberculosis among dairy herds. As an example of the distribution of the disease the author outlines the history of a herd of 46 cattle which was sold to 12 different persons and of which 32 animals were later found to be tuberculous. Fortunately the tuberculous infection was discovered in most instances before the disease had spread to other animals. This, however, is a good illustration of the necessity of applying the tuberculin test before buying cattle for introduction into the home herd.

Bovine and human tuberculosis, P. BESSE (*Arch. Méd. Expér. et Anat. Path., Paris, 16 (1904), No. 3, pp. 375–387, figs. 5*).—The various forms of human and bovine tuberculosis are described. Three cases of pearl disease, or serous tuberculosis, in man are described, and attention is called to the identity of the lesions with those in cattle. In 2 of these 3 cases there was good evidence that the primary infection took place through the walls of the alimentary tract. The identity of bovine and human tuberculosis is considered unquestionable.

Are the human and bovine forms of tuberculosis due to one bacillus? J. LIGNIÈRES (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 8, pp. 241–247*).—All tubercle bacilli belong to the same group, but may be readily classified into distinct varieties which differ in cultural and pathogenic characters. The bovine, avian, and human

types may be distinguished, and as a rule these types are found in the corresponding animal organisms. Occasionally, however, tubercle bacilli of the bovine type are found in cases of intestinal tuberculosis in man. The disease is believed to be easily transmissible from animals to man.

Tuberculosis, the chief defect in slaughtered animals, MALKMUS (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 13, pp. 122–124*).—Attention is called to the provisions of the German meat-inspection laws regarding the procedure with the meat of tuberculous animals. Such meat is not considered as dangerous for food except in cases of generalized tuberculosis.

Inoculation of dogs with human tuberculosis, LEUDET and G. PETIT (*Rec. Méd. Vét., 81 (1904), No. 9, pp. 298–303*).—In one series of experiments it was found that quite uncertain results were obtained by spraying diluted virulent cultures of human tubercle bacilli into the respiratory passages of dogs by means of an atomizer. Dogs were easily infected by means of intravenous or intrapleural inoculation or through the alimentary tract. The authors believe therefore that dogs may become agents in the distribution of tuberculosis.

Mammary tuberculosis, L. NATTAN-LARRIER (*Arch. Méd. Expér. et Anat. Path., Paris, 16 (1904), No. 2, pp. 177–190, pl. 1, figs. 2*).—Suspected pathological fluids were tested by inoculating guinea pigs in the mammary glands. A histological study of the milk was then made from day to day. The results obtained by this method are critically discussed. The method is recommended especially for the study of tuberculous pus and cephalorachidial fluid. The rapidity and accuracy of the method are quite satisfactory. It is considered of equal value with the subcutaneous method, but inferior to intraperitoneal inoculation.

Tuberculin (*Clin. Vet., 27 (1904), No. 2, pp. 1–8*).—A brief discussion of the action and value of tuberculin. The conclusion is reached that tuberculin is nearly an infallible test.

Ringworm on cattle (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, pp. 705, 706*).—Affected areas of skin may be successfully cured by treating repeatedly at intervals at 2 or 3 days with a mixture containing 1 pt. of fish oil per ½ lb. of sulphur.

Hematuria of cattle, MOUSSU (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 8, pp. 222–227*).—A controversial article on the means of transmission of this disease.

Variations in the size of beef cystocerci, KÄPPEL (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 15, p. 143*).—A number of measurements were made of cysticerci of different ages and the results are presented in tabular form.

The treatment of contagious vaginitis, ESTOR (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 27, pp. 265–267*).—Vaginitis is believed to be responsible for many cases of sterility in cows. Good results were obtained by the author from the internal application of chinosol mixed with a bland oil.

Milk fever before calving, A. HÖIJER (*Finsk Veterinärtidskr., 10 (1904), No. 2, pp. 48, 49*).—A brief discussion is presented of the occurrence of this disease before parturition. In one case excellent results were obtained from the application of the air treatment. A normal parturition took place without help on the day following the administration of air, and the cow made complete recovery.

Cases of puerperal eclampsia before calving, H. V. HELANDER (*Finsk Veterinärtidskr., 10 (1904), No. 2, pp. 46, 47*).—Two cows which developed milk fever just previous to calving were treated with injections of potassium iodid without success, death resulting in both cases. With a third cow with similar history the air treatment was adopted, with the result that great improvement took place within a few hours and complete recovery after a few days.

Husk or hoose in calves (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, pp. 703, 704*).—The symptoms and etiology of this disease are briefly described. In combating the trouble, it is recommended that calves be not allowed to graze on

marshy ground and that each affected calf be given daily 1½ tablespoonfuls of a mixture containing 1 dr. oil of cloves, 3 oz. spirits of turpentine, and 24 oz. linseed oil.

Prevention of white scour in calves (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 6, p. 540*).—In treating this disease it was found necessary to disinfect the premises as well as navel of new born calves.

The sheep nostril fly (*Jour. Bd. Agr. [London], 11 (1904), No. 4, pp. 227–230, figs. 7*).—Notes are given on the habits and means of combating *Oestrus ovis*. Treatment of the nostrils with deterrents and isolation of infested sheep are recommended in controlling this pest.

Experiments on artificially diminishing the metabolism of protein in a sheep with fever, S. WEBER (*Arch. Exper. Path. u. Pharmakol. (1902), pp. 19–47; abs. in Ztschr. Diätet. u. Phys. Ther., 7 (1904), No. 12, pp. 696, 697*).

A clinical and bacteriological study of swine plague, T. GUERRIERI (*Clin. Vet., 27 (1904), No. 14, pp. 81–84*).—Distinction is made from a clinical and bacteriological standpoint between swine erysipelas, hog cholera, and swine plague.

Pyroplasmosis in the horse, C. S. DE LA CALZADA (*Gac. Med. Zool., 28 (1904), No. 2, pp. 19–25*).—This disease is also known under the name equine malaria. The blood parasite is described and notes are given on the symptoms, etiology, and treatment of the disease.

The leucocytes of the blood of the horse, and certain experimental leucocytoses, C. BIDAULT (*Arch. Méd. Expér. et Anat. Path., Paris, 16 (1904), No. 2, pp. 355–374, figs. 6*).—The different kinds of leucocytes are carefully described and notes are given on the technique of their examination. According to counts made by the author, the number of leucocytes in the healthy horse varies from 10,000 to 11,000 per cubic centimeter. The relative proportions of the various kinds of leucocytes are also indicated. Pilocarpin increased the number of polynuclear and eosinophilous cells, while iodid of potash affected the mononuclear cells. Antitetanus serum caused a marked polynucleosis and similar effects were observed after hypodermic injections of mallein. A hyperleucocytosis was always produced in healthy horses by mallein.

A North African trypanosome, RENNES (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 8, pp. 248–250*).—Brief notes are given on the symptoms and etiology of a horse disease known as zousfana, and differing from dourine. The symptoms in horses closely resemble those of sleeping sickness in man.

Poisoning of horses from eating the plant Ornithogalum thyrsoides, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 48–50*).—Horses were killed by eating this plant. Feeding experiments showed that 3 lbs. of the green plant were sufficient to cause death with symptoms of great depression and acute gastro-enteritis.

Abortion of mares, R. E. WEIR (*Jour. Dept. Agr. West Australia, 9 (1904), No. 3, p. 143*).—Brief notes are presented on the causes and treatment of this disease. Antiseptic treatment with corrosive sublimate is recommended.

Two cases of tetanus cured by subcutaneous injections of carbolic acid, G. CROCE (*Clin. Vet., 27 (1904), No. 11, pp. 61–64*).—In one case in a horse a cure was effected by 4 injections of 10 gm. each of a mixture containing 1 gm. carbolic acid per 100 gm. glycerin. In a second case, with more alarming symptoms, much larger doses were given with satisfactory results.

Some experiments with Soberheim's anthrax serum, A. HÖIJER (*Finsk Veterinärtidskr., 10 (1904), No. 3, pp. 68–74*).—A brief review is presented regarding the results obtained from the use of this serum in treating anthrax in horses and other animals. It was found that this serum possesses considerable bactericidal power toward the anthrax bacillus.

Notes from practice, O. NOACK (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 25, pp. 247, 248*).—The author reports poor results from the use of antitoxin in the treat-

ment of tetanus. Better success was had with injections of carbolic acid and glycerin. Recovery took place in 6 out of 9 cases in horses and mules. Milk fever was rapidly cured in 8 cases by infusions of oxygen or atmospheric air.

A historical account of anthrax vaccination in the government of Kherson (1882–1903), A. Nitzkevich (*Arch. Vet. Nauk, St. Petersburg, 34 (1903), No. 5, pp. 421–443*).—A general account of vaccination against anthrax as used in the Kherson Government of Russia, with notes on the rate of mortality after vaccination.

Treatment of rabies in dogs, S. V. Obukhov (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 5, pp. 419, 420*).—Brief notes on the symptoms and treatment of this disease.

Preliminary report on the treatment of persons bitten by mad wolves, V. Babes (*Ztschr. Diätet. u. Phys. Ther., 8 (1904) No. 1, pp. 3–12*).

A serious turkey disease, M. Grinnell (*Reliable Poultry Jour., 11 (1904), No. 5, pp. 559 560*).—Experiments with blackhead are reported.

AGRICULTURAL ENGINEERING.

A report on irrigation conditions in the Yakima Valley, Washington, O. L. Waller (*Washington Sta. Bul. 61, pp. 29*).—An account of studies made in cooperation with the Irrigation Investigations of this Office of the water supply of the Yakima and Natches river systems, the amounts of water claimed and used, measurement and distribution, duty of water, the value of land and water, seepage losses and drainage, and legal and administrative problems. Recommendations are made regarding needed legislation and the organization of an administrative system.

Irrigation in Siam, J. H. van der Heide (*Bul. Écon., Dir. Agr. et Com. Indo-China, n. ser., 7 (1904), No. 29, pp. 490–524, map 1*).—This report discusses in detail the possibilities of irrigation and the need of drainage in the lower Valley of Menam, and describes a plan for extending the present system of irrigation for rice to cover an area more than half the size of all the lands now actually in cultivation in Siam. It is claimed that the proposed system will more than double the yield of rice and greatly increase and facilitate internal navigation.

The irrigation of the Chentu Plateau, A. Little (*Scottish Geogr. Mag., 20 (1904), No. 8, pp. 393–403, pls. 2, figs. 5*).—This is an extract from a book by this author on The Far East, and describes the elaborate system of irrigation which has been followed from time immemorial on this very fertile and densely populated plain, which has an area of 2,400 square miles.

Treatment of a reservoir of the Butte Water Co. with copper sulphate, E. Carroll (*Engineer. News, 52 (1904), No. 7, pp. 141–143, figs. 2*).—The treatment by the method recommended by Moore and Kellerman of this Department is said to have proved "harmless, cheap, and effective."

On artificial underground water, K. A. Widegren (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 7, pp. 682–690*).—A summary of previous articles by the author noted elsewhere (E. S. R., 15, p. 622).

River Improvement and Drainage Association of California (*River Imp. and Drainage Assoc. California Bul. 1, pp. 8*).—A brief account of the organization of this association.

Methods of estimating stream flow, J. C. Hoyt (*Engineer. News, 52 (1904), No. 5, pp. 104, 105, figs. 4*).—Methods commonly used are described.

Preliminary report on the building stones of Nevada, including a brief chapter on road metal (*Univ. Nevada, Bul. Dept. Geol. and Min., 1 (1904), No. 1, pp. 63, pl. 1*).—This is a preliminary report which discusses the main principles governing the selection and use of building stones and road metal, and describes

briefly the stones now in use or which can easily be obtained in Nevada, with their location and availability.

Historic highways of America, A. B. HULBERT (*Cleveland, Ohio: Arthur H. Clark Co., 1904, vol. 12, pp. 202, maps 3*).—This volume deals with the pioneer roads and the experiences of travelers. For notice of previous volumes of this series see E. S. R., 15, pp. 415, 1135.

On the durability of American swing plows, E. JÖRGENSEN (*Tidsskr. Landökon., 1904, No. 2, pp. 137–145*).

Trials with preservatives for plows, E. JÖRGENSEN (*Tidsskr. Landökon., 1904, No. 6, pp. 311–313*).—A mixture of 1 part chalk and 2 parts tallow, applied hot, was found effective as a preservative for the iron parts of plows.—F. W. WOLL.

Trials with Korsgård's potato harvester, E. JÖRGENSEN (*Tidsskr. Landökon., 1904, No. 6, pp. 307–310*).

Trials with reapers and mowers, E. JÖRGENSEN (*Tidsskr. Landökon., 1904, No. 2, pp. 146–158*).

Trials of agricultural machinery in Denmark during 1903, E. JÖRGENSEN (*Tidsskr. Landökon., 1904, No. 2, pp. 117–136*).

Agricultural motors, G. COUPAN (*Les moteurs agricoles. Paris: J. B. Baillière & Sons, 1904, pp. 484, figs. 269; rev. in Jour. Agr. Prat., n. ser., 7 (1904), No. 16, pp. 524, 525; Rev. Sci. [Paris], 5. ser., 2 (1904), No. 7, pp. 49–51*).—This treatise forms one volume of *Encyclopédie agricole*, published under the direction of G. Wery. The detailed account of the various agricultural motors which are grouped in four classes—animal motors, vapor motors, explosion motors, and miscellaneous (wind, water, and electric), is preceded by a discussion of general mechanical principles.

Round cotton bales, D. A. WILLEY (*Amer. Inventor, 12 (1904), No. 9, pp. 198, 199, figs. 5*).

MISCELLANEOUS.

Seventeenth Annual Report of Maryland Station, 1904 (*Maryland Sta. Rpt. 1904, pp. XVI+104*).—This contains a brief outline of the work of the station during the year by the director; the organization list, a financial statement for the fiscal year ended June 30, 1904, and reprints of station bulletins 90–92, on the following subjects: Experiments on the control of the San José scale (E. S. R., 15, p. 978), experiments with nitrogenous fertilizers (E. S. R., 16, p. 138), and notes on apple culture (E. S. R., 16, p. 156).

Eleventh Annual Report of Minnesota Station, 1903 (*Minnesota Sta. Rpt. 1903, pp. 280*).—This includes the organization list of the station; a report of the director containing a financial statement for the fiscal year ended June 30, 1903, and a review of the different lines of station work; and reprints of Bulletins 77–82 of the station on the following subjects: Insects notably injurious in 1902 (E. S. R., 14, p. 779); experiments in sheep husbandry (E. S. R., 14, p. 994); investigation in milk production (E. S. R., 14, p. 1003); alfalfa, its chemical development, feeding value and digestibility, and the digestibility of hog millet (E. S. R., 14, pp. 958, 992, 993); review of the work of the Northeast Experiment Farm since its organization in May, 1896 (E. S. R., 15, pp. 233, 236, 252, 260, 290); and hemorrhagic septicemia (E. S. R., 15, p. 514).

Abstracts showing the acreage under crops, and the number of live stock in each county and province for 1903–4 (*Dept. Agr. and Tech. Instr. Ireland, 1904, pp. 19*).—In this pamphlet statistics are presented in tabular form on the total acreage of various crops in Ireland indicating also the amount of decrease or increase over former years. Lists are also given showing the numbers of various kinds of live stock.

Agricultural returns, 1903 (*Bd. Agr. and Fisheries* [*London*], *Agr. Returns, 1903, pp. 33*).—Tables showing the total produce and yield per acre of the principal crops in each county of Great Britain, with summaries for the United Kingdom. Brief notes on the different crops are also given.

Agricultural statistics of Ireland with detailed report for the year 1903 (*Dept. Agr. and Tech. Instr. Ireland, 1904, pp. XXXIII+165*).—This report contains statistics on crop areas, crop production, land holdings, numbers of various kinds of live stock, forest areas, extent of beekeeping, and other statistical details of interest to farmers.

Notes on Egyptian agriculture, G. P. Foaden (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 62, pp. 61, pls. 6, figs. 3*).—This bulletin discusses agricultural conditions in Egypt and lays special stress upon the culture of cotton and its importance to the country's export trade. Soils, irrigation, labor, value of land, and the seasons are considered and much statistical information is included.

In addition to cotton culture, which is described in detail, the bulletin also presents brief descriptions of the culture, value, and uses of sugar cane, sugar beets, berseem, alfalfa, corn, wheat, barley, rice, beans, onions, millets, sorghums, and a number of minor crops.

The fertilizer and rotation experiments with cotton reported here have been noted from another source (E. S. R., 14, p. 754).

Organization of the Bureau of Chemistry (*U. S. Dept. Agr., Bureau of Chemistry Circ. 14, pp. 15*).—This contains general statements concerning the organization and work, and a complete list of the publications of the Bureau.

Experiment Station Work, XXVI (*U. S. Dept. Agr., Farmers' Bul. 202, pp. 32, figs. 9*).—This number contains articles on the following subjects: Reclamation of flood-damaged lands, mulching vegetables and fruits, the cultivation of orchards, thinning apples, pop corn, fruit for farm animals, protein for dairy cows, cost of raising calves and pigs, manufacture of sage cheese, manufacture of cottage cheese, and a cheap fruit evaporator.

International catalogue of scientific literature. L—General Biology, H. W. M. Tims (*Internat. Cat. Sci. Lit., 2 (1903), pp. 120*).—As in previous numbers of this catalogue a general list of authors is presented followed by a subject catalogue in which the different publications are arranged alphabetically and with authors.

Hints on making nature collections in public and high schools, W. H. Muldrew (*Ontario Agr. Col. and Expt. Farm Bul. 134, pp. 23, figs. 20*).—The author briefly outlines certain desirable methods to be observed in collecting and preparing museum specimens of insects, birds' nests, and other objects in natural history for use in the public schools. A brief list of books bearing on this subject is also given.

NOTES.

Iowa College and Station.—A new dairy building, 110 by 60 feet, is in process of erection, and is expected to be ready about January 1, in time for the use of the dairy school. The building is of cream-colored brick with Bedford stone trimmings. The construction is fireproof, reinforced concrete being used. There are three stories, a basement, and a large attic. The walls of the corridors and workrooms have a wainscoting of enameled brick 5 feet high, with cream pressed brick above. The floors are largely concrete. The lockers and the refrigerating machinery are located in the basement. The building will cost, with equipment, from $55,000 to $60,000. Plans have been made for a new agricultural building to cost from $250,000 to $300,000. This building will have a frontage of 244 feet by a depth of 80 feet in the main part, with a central wing at the rear 70 by 80 feet. There will be three stories above a high-working basement, and an attic which may be used for some departments. On the second and third floors in the central wing there will be an assembly room, which will accommodate about 1,200 people. The building will accommodate the departments of agronomy, soils, agricultural chemistry, horticulture and forestry, and animal husbandry, and offices for the dean and director and for other experiment station purposes. For the present the domestic science department will occupy the top floor. The plans call for fireproof, steel construction, with stone exterior. The drawings of the building, displayed at the Des Moines convention, show a handsome and impressive structure. W. H. Ogilvie has been appointed station editor, and will have charge of the editing and proof reading of the bulletins and of the mailing list.

Kentucky Station.—W. G. Campbell, assistant in cooperative experiments, is no longer connected with the station.

Maine Station.—Edith M. Patch has been appointed entomologist to the station.

Missouri University and Station.—M. F. Miller, formerly of Ohio State University, is now in charge of the department of agronomy, with A. E. Grantham as assistant.

North Carolina Station.—Gordon M. Bentley has been appointed assistant entomologist in the State Department of Agriculture and the experiment station.

Pennsylvania Station.—N. C. Hammer, a graduate of the University of Virginia in the class of 1902, and A. W. Clark, a graduate of the University of Vermont in the class of 1904, have been appointed assistant chemists in the station. The United States Secretary of Agriculture has appointed F. W. Christensen assistant expert in animal nutrition, in conformity with the agreement recently made with the station, and assigned him to duty in connection with the cooperative experiments with the respiration calorimeter. R. E. Stallings, assistant in animal nutrition, will devote his entire time during the remainder of the year to the investigations with the respiration calorimeter. The dedication of the new library took place Nov. 18. The library is the gift of Mr. Andrew Carnegie. It is built of light-colored brick and stone and cost $150,000.

Porto Rico Station.—The annual report of this station for 1904, recently received, states that an effective hymenopterous parasite of the coffee-leaf miner (*Cemiostoma coffeella*) has been discovered and its habits and life history are being studied with the view of distributing the parasite to plantations in which its operation is not evident. Only

about 1 per cent of burrows in coffee leaves at the station contain living Cemiostoma larvæ, while evidence of larvæ or pupæ of the parasite is found in about 25 per cent of the leaves. A bacterial, or possibly fungus, disease of the Cemiostoma larvæ is also apparent; a large percentage of the burrows contain dead larvæ of all sizes. It is estimated that the leaf miner destroyed 5 to 10 per cent of the Island's coffee crop in 1903. Recent additions to the collection of bananas and plantains now growing on the station grounds bring the list up to about 65 named varieties. The Tanier (Xanthosoma) collection now contains over 40 named varieties. Over 20 kinds of yams (Dioscorea) are being tested.

Rhode Island College and Station.—The college, through its extension work, is planning to make special effort this fall and winter to increase its usefulness by sending members of its faculty to different parts of the State, where needed, to deliver lectures on various horticultural subjects. Matthew Steel, of New Mexico, recently scientific aid in the Office of Experiment Stations, has been appointed assistant chemist in the station.

Vermont University and Station.—The State legislature has appropriated $60,000 for the erection and equipment of an agricultural building, which has been greatly needed by the agricultural department of the university and the experiment station. It is planned to spend about $50,000 on the building, leaving $10,000 for the equipment of the offices, class rooms, and laboratories.

Virginia College and Station.—Laboratory equipment for studies in bacteriology, and for the preparation of cultures for the inoculation of various legumes has been ordered. Investigations along this line will be conducted by Dr. Meade Ferguson, bacteriologist of the station. Some important work has been undertaken by the veterinary department looking to the isolation of germs of a disease which has proved very destructive to some classes of live stock in this State. It is believed to be caused by a new and distinct organism. The station staff is cooperating with the State board of agriculture in holding institutes in various parts of the State. The college made an elaborate exhibit of live stock at the State Fair at Roanoke, and also at Radford. Representative herds of Shorthorn, Hereford, Aberdeen Angus, Holstein-Fresian, Jersey, and Guernsey were shown. Plans have been completed for a new cattle feeding barn, 100 ft. long and 40 ft. wide. This barn will be erected immediately, and will provide shelter for 100 head of cattle. It is designed especially for experimental purposes.

Arlington Experimental Farm.—An implement storage building 36 by 100 ft. and two stories high has been completed. The basement will be used for the cold storage of nursery stock and the second floor as a carpenter room. Attached to the same building is a boiler house 30 by 40 ft., which has just been completed. This will be the central heating plant for all of the buildings on the place. The foundations for two greenhouses, each 20 by 100 ft., have been laid. This is the beginning of a bank of about 10 houses which it is proposed to build.

Central Experiment Station of Cuba.—The staff of this station as at present organized is as follows: F. S. Earle, director; N. S. Mayo (formerly of the Kansas station), vice director and chief of the department of animal industry; C. F. Baker, chief of the department of botany; M. T Cook, chief of the department of plant pathology; F. Cruz, chief of the department of agriculture; and C. F. Austin (formerly of the Maryland station), chief of the department of horticulture. The chief of the department of chemistry has not yet been selected. In addition to the regular assistants, student assistants are also employed in the various departments. The station has no board of control, but is directly responsible to the Secretary of Agriculture. Dr. Mayo was present at the Des Moines meeting of the Association of American Agricultural Colleges and Experiment Stations, as a representative of the station, and expressed himself as much impressed with the opportunities for work of great usefulness. The grounds of the station are now being put in order, and chemical,

botanical, agronomical, and bacteriological laboratories are being fitted up. The station is reported to be receiving the cordial support of the Cuban Government and the people.

Normal Farmers' Institute in Pennsylvania.—A normal institute for farmers' institute workers, lecturers, and local managers was held at Bellefonte and State College, October 11–15, under the auspices of the State department of agriculture. There were about 135 in attendance. Lectures were delivered by college and station men on such subjects as soil improvement, animal nutrition, principles of plant breeding, principles of animal breeding, fruit culture, market gardening, breeding in relation to disease, potato culture, and the like; and a number of speakers from outside the State were present. Among the papers presented was one by John Hamilton, of this Office. One of the ways suggested by Professor Hamilton for increasing the supply of efficient institute lecturers, directors, and managers was by the establishment of interstate normal farmers' institutes. For this purpose a union of the States into groups of 6 to 8 each was suggested, the school to be held each year at different institutions within the group. The teaching force could be made up of specialists contributed by each institution, and the course of lectures be extended to cover a period of 4 to 8 weeks each session. A complete course of study would cover a period of at least 2 years, and certificates might be given to those who passed the examination in any of the courses offered. Classes could be organized on special subjects with specialists to teach them, and by the combination of the several States the increased attendance thus assured would be sufficient to practically pay for the expenses of the teaching force. It was believed that "such a set of schools properly equipped will do as much to assist farming people as any other single institution in existence, important as many of them are. . . . The organizing of interstate normal schools of agriculture for institute workers is the next great advance that the institute movement is destined to secure. When this is had, then the great need of the institute movement will be supplied—the need for means of equipping a large number of capable and enthusiastic men and women who will carry the news of a better agriculture to farming people." The proceedings of the meeting will be published.

Agricultural Instruction for Farmers in Victoria.—In a recent survey of the work and progress of the Victoria Department of Agriculture, the director for agriculture states that in order to better instruct farmers on agricultural matters, classes of instruction for farmers and farmers' sons, extending over several weeks, have been established in seven different centers. The results of two years' work along this line have been very satisfactory, and it is stated that this method of instruction has come to stay in Victoria and will extend over the whole of Australia. The winter season appears to be the only time when farmers can devote the daytime to lectures and study. In order to meet the demands for all classes during the winter months it has been found desirable to maintain a teaching staff for the whole year, since it is difficult to pick up suitable teachers just for the 3 or 4 months of the winter season. A plan has therefore been matured for keeping the force which it is proposed to thus engage in active service during the whole year. It is the purpose of the director to have evening classes of 2 weeks' duration held at farmhouses, where classes of from 10 to 12 may be organized. These classes will be held all the year around except in the winter time, when the officers will be engaged at the farmers' day classes, according to the present plan of operation. The proposed plan is outlined as follows: "The lectures would be held in the evening, say one and a half hours' lecture and a half hour devoted to asking and answering questions. Four lecturers would be required, one of whom would arrive on a Monday and stay 3 days lecturing and discussing such subjects as manuring suitable to the district, tillage, rotation of crops, and kindred subjects. On the fourth day he would leave for another center, say 20 miles away, and would be replaced by an officer competent to lecture on farm stock,

their breeding and management. In 2 days the second lecturer would leave, being replaced by a third who might lecture upon poultry, the best breeds to be kept for export and laying purposes, the management and feeding of poultry, etc. Two days later this lecturer would be replaced by a fourth, who would lecture on other agricultural subjects. The course of instruction at this particular farmhouse would then terminate after 10 days' instruction. Four classes would be in progress at one time in farmhouses sufficiently far apart to prevent overlapping, and yet near enough for the officer to reach the next center and lecture on the same day."

Agriculture at the British Association.—At the recent meeting of the British Association Dr. Wm. Somerville made the opening address as chairman of the subsection on agriculture. The address covered such subjects as the "fæcal excretions" of plants, the stimulating and exhausting effects of manures, German investigations on the action of conserving agents on farmyard manure, chemical fixation of atmospheric nitrogen, Nitragin, improvement of varieties of crops, and cooperative work. The result of German investigations in the preservation of stable manure were said to indicate no preservative effect but rather a loss of nitrogen by the use of such agents as kainit, superphosphate, precipitated phosphatic gypsum, and gypsum. It appears that superphosphate may conserve nitrogen to an appreciable extent so long as the manure lies in the stall, but its effects disappear whenever its acid phosphate and free sulphuric acid are neutralized by ammonia, and this rapidly occurs in the pit. Sulphuric acid sprinkled over manure as it was placed daily in the pit reduced the loss of nitrogen from 27.8 to 7.1 per cent, but the cost for this preservative was excessive, and its use is associated with so many drawbacks that its employment can not be recommended. The general conclusion appears to be that the excessive loss of nitrogen in manure can be best avoided by storing it in a deep compact mass in a water-tight pit in a well-shaded situation. Dr. Somerville pointed out that in field experiments with calcium cyanamid results about 20 per cent below those obtained by the use of an equal amount of nitrogen in the form of sulphate of ammonia have been obtained, while in pot cultures much better results were secured than either with nitrate of soda or sulphate of ammonia. It is thought that possibly root acids in the soil may partly change the calcium cyanamid into the dicyanamid, a substance directly poisonous to plants. A review of the present status of Nitragin shows a renewed interest in this matter both in Germany and in the United States. Previous "failure of the Nitragin to effect an improvement in the crop when it was sprinkled on the seed is now believed to be due to the action of secretions produced by the seed in the early stages of germination." The present indication was said to be that this difficulty may be obviated by cultivating the bacteria in a medium that imparts to them the necessary power of resistance. In speaking of the improvement of crops by selection, some striking figures were given showing the differences in growth of spruce trees from seed selected from mother trees varying considerably in dimensions and situated at various altitudes. In general the seedlings follow closely after the mother trees in rapidity and manner of development.

Miscellaneous.—A pamphlet of 15 pages, entitled A Tribute to Levi Stockbridge, by William H. Bowker, a former student and of late years a member of the board of trustees of the Massachusetts Agricultural College, has been received. The paper was read at the memorial exercises held for Professor Stockbridge at the college last commencement, and contains many interesting personal recollections, as well as a tribute to Professor Stockbridge as a teacher and in making practical application of scientific truth to agriculture.

A recent pamphlet entitled Obituary Notices of Fellows of the Royal Society, part 3, contains notes by "R. W." on Sir John Bennett Lawes and Sir Joseph Henry Gilbert, and on the agricultural investigations conducted jointly by these two men. These notices are especially interesting, as they were written by one who had an

inside view of the work at Rothamsted and an unusually intimate knowledge of the men. With reference to their joint work the writer says:

The government of the Federated Malay States has, according to a note in *Nature*, decided to establish an agricultural department in Malay, and has appointed Mr. J. B. Carruthers, the government mycologist and assistant director of the Royal Botanic Gardens of Ceylon, to be director of agriculture and government botanist. "The Federated Malay States have an area of more than 25,000 square miles, and the agricultural potentialities are very promising. Large areas are being planted with rubber plants, and sugar and cocoanuts are extensively cultivated. There are two botanic gardens and a rubber experiment station in the Malay States, and all three are, we understand, to be administered by the new department."

The American Association of Farmers' Institute Workers held its ninth annual meeting in the Agricultural Building on the World's Fair Grounds, St. Louis, October 18-20. About 100 members, representing 30 states and provinces in the United States and Canada, were present, and the meeting was considered one of the most successful and helpful ever held. President J. C. Hardy, of Mississippi, was élected president of the association, and G. C. Creelman, of Guelph, Canada, was elected secretary. It was decided to hold the meeting next year at Baton Rouge, La.

It is announced in *Nature* that Dr. Robert Koch has retired from the post of director of the Institute for Infectious Diseases, at Berlin, owing to the increasing demands which other bacteriological work make upon his time and energies. Prof. Koch will proceed to German East Africa in order to continue those studies of tropical and other diseases which he had not completed during his recent visit to Rhodesia. In particular he will continue to investigate the part played by ticks in conveying the infection of various cattle diseases.

Thomas J. Dwyer died at his home in Cornwall, N. Y., October 3, from the effects of a strain which resulted in aneurism of the right artery. He was 49 years old. He was the author of a book entitled Guide to Hardy Fruits and Ornamentals, published in 1903, of which the second edition has already been printed.

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EXPERIMENT STATION RECORD.

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The relation of the experiment station to the department of instruction and to various forms of extension work in agriculture proved a very live topic of discussion at the recent annual convention of the Association of American Agricultural Colleges and Experiment Stations, at Des Moines. The matter came up on several occasions in the general sessions of the convention, and the question "How much teaching, if any, is it desirable that a station worker should do?" was a special theme for conference before the section on experiment station work. The general tenor of this discussion and the attitude in which it was approached were most gratifying, and evidenced a clearer appreciation of the important field and the higher purpose of the experiment station.

A great deal has been said of the advantage to the station man of being connected with the teaching force of the college, of coming in contact with students, and of so presenting his work that it will be within their grasp. It has been urged as an inspiration to the investigator, and a safeguard against straying too far from the practical in the ultimate aim of his work. The practice of requiring station men to serve in this dual capacity has been very general ever since the stations were established, and at present about fifty-four per cent of the station workers do more or less teaching. The amount varies greatly, a few giving only a limited number of lectures on advanced subjects, while others carry an entire department of instruction, either alone or with the aid of young assistants. "The tendency seems to be toward an increase in the number of station men who are also doing teaching work," and apparently also toward a greater rather than a less amount of teaching on the average. This is due, in part at least, to the recent growth of agricultural education and the differentiation of agricultural instruction, which have made the demand for additional instructors more pressing.

While it was quite generally conceded by the speakers at this conference that a "certain amount" of teaching might be advantageous to station workers, there was equal unanimity that an uncertain or indefinite

amount is not advantageous, but is often prohibitory of any work which can be regarded as investigation. The kind of teaching required is also an important consideration. The distinction was emphatically made between teaching elementary branches, or the fundamentals, and advanced work. The teaching done at the agricultural colleges in this country is of necessity very largely the teaching of fundamentals, and this was held to be a disadvantage rather than an advantage to the investigator. One director of long experience declared the claim that the teaching of fundamentals and the drilling of classes for fifty per cent of his time is an advantage to the investigator to be "nothing but a pleasant fallacy."

Ten to twenty lectures a year by the heads of departments was mentioned by several speakers as a fair amount which might be conceded to be an advantage to the worker, as a means of gathering himself together and clarifying his views; and others mentioned a course of advanced instruction occupying six hours a week and so arranged as to leave three days a week entirely free from teaching. All agreed that any considerable amount of teaching, even of advanced grade, was disadvantageous to the station worker, as it distracted his thoughts from his investigation and consumed or broke up his time.

Few men have the faculty which enables them to pass readily from their teaching work to their investigation, or to utilize to advantage for that purpose fragments of time represented by a few hours scattered through the day. There is great loss of energy and of efficiency under such conditions, and the spare time is likely to be largely frittered away. The situation might often be relieved by greater consideration for the station men in arranging the schedule of instruction. The time of a half-station man may be so completely broken up by two or three periods of class-room work a day that only work of the simplest kind, requiring the minimum of attention, is possible. Some institutions arrange to have the teaching of such men come during a certain part of the day, or on alternate days, or during half the year, so as to leave more time free from interruption. If a part of the year can be left free from college duties, one serious objection to the dual service is met.

Again, the uncertainty of the amount of college work liable to be required of him introduces an element of doubt which often discourages the station worker from planning any investigation requiring his continued attention. Many exigencies arise in college work, such as an extra large class, the demand for a course not usually given, pressure of short courses, absence of the regular college instructor, and the like, in which case the station man is pressed into extra service; and these contingencies often tend to make the station man feel that his time is not his own until the college term has closed.

A number of stations where the division of time has heretofore been satisfactory, owing to the limited demand for agricultural instruction, are now becoming embarrassed by the increased call for their services in that line. These stations frankly admit that unless additional funds can be secured to provide adequately for the teaching work they can not hope to maintain the high position in agricultural research which they have occupied. This is one of the dangers of the increased interest in agricultural education and the differentiation of agricultural courses. The number of students increases and courses are multiplied, without increased appropriations or any material aid to the teaching force, and the erstwhile investigator finds himself doing full teaching work, with lectures to be revised and adapted, examination papers, practicums, faculty duties, and students coming to him for advice and assistance.

Every station director of experience will admit that the undivided time of one man is far more effective and valuable to the station than half the time of two men with college duties. As one speaker put it, "In this matter two and two do not always make four. I am sure that two half men are not anywhere equal to one whole man, and to go still further, I do not think that four quarter men are worth anything" (in investigation). This strikes the keynote of a popular delusion.

The effect of the dual position on the character of station work and the development of agricultural investigation is an important point to be considered in this connection. There is a vast difference in the quality of station work, growing out of the men themselves, and the conditions under which they are working. Many men have been placed upon the station staff as a matter of expediency or custom who are not suited to the work and who regard it as an added burden. Because a man is a good teacher it does not follow that he will make a resourceful and energetic experimenter. Much of the work done at the stations is not investigation or research in the proper sense of the word. It is merely the testing of this or that crop, this or that method of culture or fertilizer, a comparison of rotations or of feeding rations, or a demonstration of some fact which has been worked out elsewhere. The nature of the case prevents it being more than this.

If we look the ground over we shall find as a very general rule that our best investigation has been done by those workers who have had least teaching to do, and, conversely, that the stations whose workers have had practically to carry their respective departments in the college—and there have been many such—have added comparatively little to the sum of agricultural knowledge. There are few exceptions to this rule, and the converse condition is so common as to be much in evidence and to keep down the average grade of experiment station work in this country.

In an address delivered at one of the congresses at St. Louis this fall Dr. David Starr Jordan quoted one of his correspondents as criticising the work in agricultural science in this country, where it is more largely endowed than in any other country, on the ground that there was too much striving for practical applications, and not enough time given for the fundamental research on which these applications must rest. "The proportion of applied science in agriculture is too great in this country. While we do not need fewer workers in applied agricultural science, we do need more workers who would devote themselves to fundamental research."

This is a fair statement of a condition, with no attempt to assign a cause. One of the fundamental causes is undoubtedly the conditions referred to above. Many a station worker is compelled by the character of his college duties to become little more than a consulting expert in his line, confining himself to the answering of correspondence and conducting a few trials or experiments, and is obliged to forego undertaking anything in the nature of an investigation. There can be no gainsaying the fact that this dual service has done much to retard the development of agricultural investigation and to discourage the efforts of investigators of much promise.

The ultimate result is the only criterion by which the advantage or disadvantage of such a practice can properly be judged. We have had practically fifteen years of experience with it, under a great variety of conditions, and it is certainly a poor theory that will not justify itself in that time. Any division of a station man's time is unwise, even though his salary may seem to be justified on the theoretical number of hours he is expected to teach, when it defeats the real purpose had in view in adding this man to the station staff and robs him of the opportunity to do work of a high order.

More men are needed for real investigation, and it is only reasonable to expect that conditions will be so shaped that we may make progress in that direction. The kind of men needed for investigators was defined by one speaker as "a man saturated with the things he is doing, and who shall not be turned aside and wearied by having to drill a class or do anything else but hunt his subject and the truth." Another speaker believed that teaching and investigating "call for a different attitude of mind and the use of a different set of faculties, to a certain extent, and that except in the case of unusually gifted men the same men are not likely to have both sides equally developed. An investigator should have his mind focused on his work more or less all the time," whereas the teacher's thought will be largely pedagogical.

Considered in the light of the extensive experience which has been had, the most that can be said for the dual arrangement, where any

considerable amount of teaching is involved, is that it is solely a matter of expediency. Dividing the salary enables both the college and the station to carry a larger number of men on its agricultural staff, to differentiate its work more, and make a show of carrying a larger number of departments; but from the standpoint of real investigation the advantage of this increased number of half or quarter men in the station is decidedly problematical. The efficiency of a station is not measured by the fractions of men it has on its staff, and it must be said that some of the stations with the longest corps of workers on their roster have contributed least to the real advancement of agricultural science and practice.

Every station man should, if practicable, do some teaching or farmers' institute work, as a means of keeping his mind directed toward the practical bearing of his investigations, and of enabling him to present them to students or farmers in an intelligible manner. But the amount should not be large or so arranged as to scatter his efforts. It should be of advanced character, and if so will naturally relate to the experimental work in hand and the results accomplished by the investigator himself and others in his particular department, together with their practical significance. Then it will not distract his mind from his work and will usually be helpful. But it must be admitted that the requirement of a large amount of elementary teaching is one of the weaknesses of our American station system, attributable to the lack of adequate funds to properly meet the rapid increase in demand for agricultural education, which has been greatly stimulated by the work of the experiment stations.

Considering the splendid work of the stations as a whole, and the potent and far-reaching influence they have exerted, not only in improving agricultural methods but in bringing about a better attitude of mind, any criticism of the returns they have rendered for the funds which have been at their disposal would be most unjust. The condition is to be taken rather as an indication of the pressing need of larger funds by both the agricultural college and the experiment station, to properly man the teaching force and to develop the department of agricultural investigation.

The former views regarding the needs of the experiment station have been modified in several important respects in recent years. The conference at Des Moines brought out the fact that a modification of the views regarding the dual function of the station worker is now clearly indicated, and that a considerable number of stations are moving as rapidly as opportunities permit in the direction of a station staff whose members shall be primarily station men. The well-nigh unanimity of opinion among station directors and workers, especially among those who are carrying on real investigation, should outweigh the theoretical claims which these fifteen years of experience

have failed to realize upon. They should lead college presidents and boards of control to deal with this question as one of the most vital at present affecting experiment station work; and it is especially desirable that it be looked squarely in the face and considered impartially at this time, when plans are being made for the use of larger funds to strengthen and develop the station work.

Another line of discussion touching the experiment stations was the provision for extension work as a branch of the agricultural college. There was a more general recognition of the fact that the agricultural college logically embraces three distinct branches or departments of work, viz, the experiment station or research department, the department of instruction, and the department for extension work. President Butterfield declared that "to carry out the function of the agricultural college we need a vast enlargement of extension work among farmers," which should be dignified by a standing in the college coordinate with research and the teaching of students. It should rank as a distinct department "with a faculty of men whose chief business is to teach the people who can not come to the college."

Among the lines of work assigned to this extension department were included the farmers' institutes, reading courses, extension lectures, the carrying on of cooperative and demonstration experiments, the editing and distributing of such compilations of practical information as now appear under the guise of experiment station bulletins, and eventually relieving the station of the bulk of its correspondence.

It was frankly admitted that the compiled popular publications which the stations have been practically forced into issuing as a matter of protection of their time are not properly station bulletins, and create a wrong idea as to the character of work which the stations are putting out. Like much of the station correspondence, it was held to belong in the extension department. The demand for the information and the personal inquiries have grown up with and out of the experiment stations, which have created a thirst among farmers for more up-to-date knowledge and for advice, which they turn to the station men to supply.

There was a strong sentiment voiced by a number of speakers that if the experiment stations are to fulfill in the highest degree the expectations which have been placed in them as agencies for research in agriculture—for adding to our fund of scientific knowledge and applying it to the practical problems in agriculture—they must cease to be all things to all men, they must be relieved of this great drain upon them, and allowed to devote themselves to their special field.

To meet this demand a special agency is needed for disseminating and demonstrating new discoveries and new methods; and the extension department, which is already organized and in operation at Cor-

nell University, and which exists in embryo at a number of other places, was confidently pointed to as one of the departments of the agricultural college of the future.

The interest in this movement was voiced by a resolution to secure if possible the granting of the franking privilege to the publications of the extension department, and thus allow them to stand for what they are, instead of distributing them under the cloak of bulletins of the experiment station. The expense of sending them out otherwise is now the only reason assigned for issuing them in the station series, and it was argued that the extension of the franking privilege to bulletins of this department of work would allow a clear and distinct differentiation of the legitimate work of the experiment station, and thereby complete the organization.

The resolution was ultimately withdrawn, but the interest with which it was discussed indicated how widespread is the feeling that the stations and their publications are being burdened with a class of material which is not strictly in their domain, and which a more complete organization of the college of agriculture should provide for in another way. It represented a very notable advance in opinion, and is a most encouraging sign of a broader and clearer conception of the respective functions and needs of agricultural instruction, agricultural experimentation, and agricultural extension, which combined go to make up the agricultural college of the future.

It was recognized that in the case of many institutions the programme is to some extent more ideal than practicable under present conditions. The change can not come all at once, but it will be something to work toward now that the need is more evident; and with the possibility of securing increased funds for agricultural work, which in many of the States is now exceptionally good, the realization of some of these ideals seems nearer at hand.

CONVENTION OF ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, 1904.

The twenty-first annual convention of this association was held at St. Louis, September 26–28, 1904. The meetings were held in room 1 of the Hall of Congresses at the Louisiana Purchase Exposition. Eighty-eight members and visitors were in attendance. In the absence of the president, M. E. Jaffa, and the vice-president, C. L. Penny, W. A. Withers presided on request of the association.

The regular business of the convention was completed during the first two days, but on the morning of the third day a joint session was held with the Association of American Fertilizer Manufacturers, in the Agricultural Building.

The following officers were elected for the coming year: *President*, C. L. Penny, Newark, Del.; *Vice-president*, C. G. Hopkins, Urbana, Ill.; *Secretary*, H. W. Wiley, Washington, D. C.; *Additional members of executive committee*, C. A. Browne, jr., New Orleans, La., and R. W. Thatcher, Pullman, Wash. The list of referees and associates has not been completed, but will be announced in a later issue. Washington was decided upon as the place of the next meeting.

The reports and papers presented at the convention, and the more important action of the association, are briefly summarized below under appropriate headings. A somewhat fuller statement of the recommendations acted upon at this convention has been issued as Circular No. 20 of the Bureau of Chemistry.

POTASH.

The report on this subject, presented by F. B. Carpenter, referee, detailed the results of a study of the sodium-hydrate method proposed last year, and a continuation of the study of methods for the determination of moisture in potash salts. All of the results by the official Lindo-Gladding method were considerably under the theoretical, while those by the modified method, using sodium hydrate instead of ammonium hydrate for neutralizing, with a few exceptions came much nearer to the calculated percentages. It was thought that some of the variations observed in the use of the modified method were due to the presence of potash in the sodium hydrate. The results on the

determination of moisture in kainit "simply confirm our previous experience and show how unsatisfactory our present official method is." The referee suggested that an arbitrary method of procedure be adopted for this determination, and proposed the heating of 2 gm. of substance at 130° C. in an oil oven for 10 hours, the loss in weight to be considered as moisture. This recommendation was referred to the referee for next year for further study.

A paper by M. G. Douk reported Experiments on the Volumetric Estimation of Potash as Phosphomolybdate. Trials of the Wavelet method (E. S. R., 12, p. 713) gave results which were too low and quite irregular. To avoid the difficulties of this method and to make it more generally applicable, the author worked out a method for titrating the yellow precipitate, which he described in some detail. The results of a few comparative trials with the official method are reported. "The method is exceedingly rapid and easy of execution, necessitating no operation by which loss of potash is liable to occur."

Recommendations.—The recommendation of the referee that the sodium-hydrate method, which has been tried for two years with favorable results, be adopted by the association was followed, but the method can not be made official until the next year's meeting. The method as suggested is as follows: Boil 10 gm. of the sample with 300 cc. of water plus 5 cc. of hydrochloric acid for 30 minutes; add a few drops of phenolphthalein and carefully neutralize with sodium hydrate free from potash, avoiding a large excess; add sufficient powdered ammonium oxalate to precipitate all the lime; cool, dilute to 500 cc., mix and pass through a dry filter, then proceed as in the Lindo-Gladding method.

PHOSPHORIC ACID.

C. B. Williams, referee, in the report on this subject, dealt mainly with the question of the proper basis for valuation of phosphatic fertilizers, particularly slag. The results for total phosphoric acid on 3 samples of slag were quite concordant in the case of the same analyst using the same method of solution, but there was often considerable variation between the results of different analysts, and between the results of the same analysts using different solvents. In the case of available phosphoric acid there was also considerable variation between workers by the same method and on the same sample. The ammonium chlorid citric acid method and the cane sugar citric acid method were the two methods which acted most energetically upon the slag, but as no data were obtained from either field or pot tests, it was impossible to say which of the solvents came nearest to representing what different plants would be able to take up from the soil in an average season.

Duplicate results secured in the determination of available lime by the 10 per cent ammonium chlorid method were tolerably concordant for each worker, but there were wide differences between analysts.

A paper by B. L. Hartwell and J. W. Kellogg, presented by H. J. Wheeler, discussed The Effect upon the Residue after Extracting the Soluble Phosphoric Acid of Postponing the Treatment with Ammonium Citrate. The differences between the amount of reverted phosphoric acid as determined at once and after standing 15 weeks were in nearly all cases within the limit of error liable to occur under the conditions of the work. The results indicated that "no large error will arise if, for the sake of greater convenience, the dried residues from the extraction with water are kept a number of weeks before the reverted phosphoric acid is removed by the ammonium citrate." The relative value of open-hearth and ordinary basic slag, and of raw and roasted redondite, was briefly discussed by several members.

A paper on the Estimation of Small Quantities of Phosphoric Acid by the Volumetric Method was read by F. P. Veitch. The deduction from the results presented was that "accurate results can be obtained on such small quantities of phosphoric acid as exist in drainage waters and water extracts of soils, neither evaporation nor filtration appearing to affect the results seriously."

Recommendations.—The referee for the coming year was instructed to continue the study of methods of determining total and available phosphoric acid in slag, and also to study the solubility of phosphoric acid in the same samples of slag reduced to different degrees of fineness. It was also recommended that the referee plan field and pot experiments with cultivated plants, looking toward the determination of the relative value of the total phosphoric acid of slag, Redonda, and precipitated phosphates of different degrees of fineness, in comparison with that of the phosphoric acid in acid phosphate and other common phosphatic materials, and invite cooperation in this undertaking on as many soil types and by as many workers as possible.

NITROGEN.

The report of the referee, C. H. Jones, read by F. C. Weber, was devoted mainly to a comparison of the neutral and alkaline permanganate methods for determining the availability of nitrogen in fertilizers. The reports received from 15 chemists were on the whole very satisfactory. The results by the neutral permanganate method agreed closely and indicated that, if directions are followed in the digestion with permanganate solution, uniformity may be obtained among different analysts. The chief trouble found in operating the alkaline method seemed to be from excessive frothing during distillation and an uncertainty as to when to stop. Serious frothing may be avoided, according

to the referee, by increasing the heat gradually after the 30 minutes digestion.

A paper by G. S. Fraps briefly summarized the results of studies on the nitrification test for availability of nitrogenous fertilizers.

A report on the separation of vegetable proteids, by J. S. Chamberlain, associate referee, gave the results of a study of wheat proteids, and referred mainly to the difficulty of securing a clear separation of groups by the use of alcohol and salt solution as solvents. The referee recommended that for the present no attempt be made to separate the proteids of wheat into individuals, but that they be given designations according to their solubility or insolubility in alcohol and dilute salt solution. It was also recommended that the total proteids be calculated from the total nitrogen as determined by the Gunning method, using the factor 5.68.

A report on the separation of meat proteids, by W. D. Bigelow, associate referee, was confined to the separation of the nitrogenous bodies in meat extracts, and was mainly a repetition of the work reported on last year. Zinc sulphate, phosphotungstic acid, and tannin salt were employed as precipitants and tested singly and in combinations. The combination precipitating the greatest amount of nitrogen was phosphotungstic acid followed by the tannin salt reagent. The amount of nitrogen precipitated by phosphotungstic acid was greater in each case than that precipitated by any other single reagent. "From the present results, confirming in the main those reported a year ago, it is believed that the most complete precipitation of all proteid bodies, including albumoses and peptones, may be obtained by means of phosphotungstic acid, followed by tannin salt reagent in the filtrate from the phosphotungstic acid precipitate." Results with zinc sulphate "do not have the conformity that is desired." In his recommendations the associate referee outlined methods for ammonia, acidity, phosphorus, chlorin, and xanthin bases (Schittenhelm's method) for adoption by the association.

Recommendations.—On recommendation of the referee (C. H. Jones), a modified form of the alkaline permanganate method was made provisional, and the referee was instructed to further compare the alkaline and neutral permanganate methods, with a view to determining the amount of material to be used in each test. The modified alkaline permanganate method is as follows: Using an amount of sample containing 0.045 gm. of organic nitrogen, digest for 30 minutes below the boiling point in a 600 cc. distilling flask connected with condenser to which the receiver containing standard acid has been attached, with 100 cc. of alkaline permanganate solution (16 gm. $KMnO_4$ and 150 gm. of NaOH dissolved in water and made to 1 liter). Then boil until 85 cc. of distillate is obtained. If the material shows a tendency to adhere

to the sides of the flask an occasional gentle rotation is necessary during distillation. The recommendations of Mr. Chamberlain and Dr. Bigelow relative to the separation of vegetable proteids and meat proteids, respectively, were adopted by the association and directed to be printed as outlined by the referees.

ASH.

The report on ash, submitted by the referee, R. W. Thatcher, gave special attention to methods of determining sulphur in plant tissues. The peroxid method was reported to give higher results than the nitric acid method, but in cases where the sulphur content was known neither method gave results approximating the total amount of sulphur.

There was some discussion of the importance of ash analysis and of defining the terms "ash" and "plant food." On motion of H. J. Wheeler a committee of five was appointed to confer with a similar committee of the botanical section of the American Association for the Advancement of Science with reference to the definition of the term "plant food." This committee consists of H. W. Wiley, H. J. Wheeler, L. L. Van Slyke, E. W. Magruder, and B. W. Kilgore.

Recommendations.—The referee was instructed to continue the study of the peroxid and nitric acid methods, and to make determinations of the total sulphur in samples used for cooperative work by the Barlow-Tollens method of combustion in a closed tube.

SOILS.

C. G. Hopkins, referee, presented the report on this subject, which dealt largely with a comparison of the results obtained by the official methods and those of the Bureau of Soils, as given in Bulletin 22 of that Bureau, especially the colorimetric methods. The results by the two methods showed considerable discrepancies, and the discussion led to the presentation of the following resolution by L. L. Van Slyke:

Whereas the methods employed by the Association of Official Agricultural Chemists for the analysis of soils and those employed by the Bureau of Soils of the U. S. Department of Agriculture yield such entirely different results where they should be identical,

Resolved, That a committee be appointed to consider the matter and to consult with the Secretary of Agriculture with a view to bringing about greater harmony in respect to methods employed in soil analysis in the United States and the conclusions based upon such analyses.

The committee appointed consists of L. L. Van Slyke, H. J. Wheeler, and F. K. Cameron.

In the course of his report as referee Dr. Hopkins referred to the use of different terms in stating the results of analysis, some chemists, for example, using "ammonia" instead of "nitrogen," and some

"potash," while others use "potassium," etc. As a result of discussion upon this point, the following committee on the unification of terms for reporting analytical results was appointed: R. J. Davidson, chairman, C. G. Hopkins, W. D. Bigelow, G. S. Fraps, and C. A. Browne, jr.

G. S. Fraps read a paper on Nitrification and Soil Deficiencies, in which he referred to nitrification as a means of determining these deficiencies, pointing out the relation of moisture, basicity, phosphoric acid, potash, etc., to nitrification. He showed that the varying power of soils to transform organic matter into nitrates under comparable physical conditions was due in part to deficiency in available calcium carbonate, potash, or phosphoric acid. Furthermore, "a deficiency in phosphoric acid for nitrification is as a rule accompanied, in the cases under observation, by a deficiency in phosphoric acid for corn and cotton." He held that investigations into the causes of the variation in nitrifying power of soils and the relation between soil deficiencies as shown by nitrification and pot experiments have an important bearing upon problems of soil chemistry and the maintenance of soil fertility.

F. P. Veitch presented a Summary of Experiments on the Relation of Soil Acidity to Fertility. The paper was based largely upon the results of pot experiments made by the Bureau of Chemistry on soils from different parts of the United States, and showed in general that all of the principal factors of soil fertility are more active in alkaline than in acid soils. The physical condition is better, there is less disease, and plants make better use of all the elements of plant food, except phosphoric acid, in alkaline soils. There was considerable discussion of the rate of liming, the depth to which applications of lime penetrate into the soil, the form of lime to be used, etc. Mr. Veitch's paper stated that "in applying lime the soil should finally be made alkaline to the full plowed depth," and that "in ordinary farm practice the acids of the subsoil are not neutralized by the applied lime."

Recommendations.—It was recommended that the investigation of methods for the determination of water-soluble plant food in soils be continued; and that the methods for determining the easily soluble plant food also be further investigated, using acid solutions of greater strength than two-hundredth-normal, as previously recommended.

DAIRY PRODUCTS.

The report on this subject, by G. E. Patrick, referee, was read by the secretary. It dealt mainly with the effect of preservative materials on the albumin of milk, and the determination of sugar in condensed milk.

Recommendations.—The study of the effect of preservatives on the albumin of milk and methods of detecting renovated butters is to be continued, and the referee was requested to study also methods for determining sugars in condensed milk and milk powders.

SUGAR.

The report of the referee, L. S. Munson, detailed the efforts to secure the cooperation of the association with the committee of the International Commission for Unifying Methods of Sugar Analysis, having under consideration the revision of methods for reducing sugars. The International Commission meets in Rome in 1906, at which time the question will be taken up; and the referee expressed his opinion that the efforts of the association in this line of work during the next coming years might well be directed to this problem.

A report on Special Analytical Methods of Sugar Analysis, by C. A. Browne, jr., associate referee, dealt with (1) the determination of levulose in the presence of dextrose and sucrose, and (2) the nature of various gums found in sugar-cane products. The work reported under the first part led to the conclusion that neither the optical nor the combination method for the determination of levulose, as they stand at present, is as exact as the polariscopic determination of sucrose, although both methods give a fairly close approximation. It was recommended that succeeding referees undertake the perfection of a method for the determination of levulose and dextrose in the presence of sucrose.

A study of the various gums occurring in sugar-cane products, carried out by Dr. Browne at the Louisiana Sugar Station, has led to the finding of a series of gums which may be divided into two classes. The first class contains gum products derived naturally from the hemicelluloses of the cane fiber, and includes xylan, araban, and traces of galactan. The amount of these gums which passes into the juice, sirup, and molasses varies according to the pressure of the rollers, the degree of maceration which the cane receives during milling, and the variety of the cane. The second class of gums do not occur naturally in the cane, but are the result of fermentation processes which set in either before or after the expression of the juice. Dextran, cellulan, mannan, levulan, and levan are examples of such fermentation gums. The properties of the gums of the two classes enumerated above were described, and it was noted that other gums of an unknown character which have been separated from cane molasses are undergoing identification.

A report on methods for the analysis of molasses, by H. E. Sawyer, associate referee, described briefly the work done, which is to be published later; and J. E. Halligan presented a paper on Analyses of

Molasses Produced by Different Methods of Manufacture, and Comparison of Methods for Determining Total Solids.

Recommendations.—The referee and his associate on mechanical methods for sugar analysis were directed to devote as much time as seemed desirable during the coming year to cooperation with the committee of the International Commission for Unifying Methods of Sugar Analysis; to continue testing the methods for the determination of levulose and dextrose in the presence of sucrose; to continue the study of methods for the identification and analysis of vegetable gums; and to take steps toward perfecting methods for the determination of caramel and other organic solids which accompany sugar in cane and beet products. It was suggested that the referee test the use of neutral oxalate of potash in place of sodium carbonate as a precipitant for lead in clarified sugar solutions, and he was requested to submit to collaborative test next year the method of molasses analysis outlined at the meeting in 1903 (E. S. R., 15, p. 440), which is soon to be published in detail.

FOOD ADULTERATION.

Reports were read on colors, by Milton G. Berry; distilled liquors, by C. A. Crampton; baking powder and baking powder chemicals, by R. O. Brooks; tea and coffee, by Hermann C. Lythgoe; beer, by H. E. Barnard; fats and oils, by L. M. Tolman; and dairy products, by A. E. Leach. W. Frear and R. O. Brooks called attention, in a short note, to a Limitation of the Arata and the Sostegni and Carpentieri Tests. The report on colors is a compilation and was submitted only in outline. It is to be published in full in circular form. The report on distilled liquors gave the results on three samples of liquors by a number of collaborators, which were quite satisfactory, indicating the present methods of the association to be efficient. The other reports detailed rather briefly the work done on special methods, and were largely reports of progress.

Recommendations.—Practically no changes of importance were made in the official methods relating to food adulteration, and the recommendations related to the further testing of methods which have been suggested for various products and the consideration by the referee for next year of various suggestions made in the reports of the associate referees at this meeting. Provisional methods were adopted for tea and coffee, which are too lengthy for publication here.

TANNIN.

The referee for this subject, G. A. Kerr, presented a report on analyses of wood extracts, fresh and leached bark, and fresh chestnut wood by the official method; studies on the cause of variation in soluble and insoluble matter found in extracts; and a further investigation of

the provisional methods for determination of acids in yard liquors. A provisional method for the analysis of barks, woods, leaves, etc., was given in detail. The referee suggested that further research be made to determine the limit of temperature at which the determination of soluble and insoluble matter should be carried out.

. Two papers were presented by F. P. Veitch, one on the Extraction of Tannin Materials with Different Extractors, and the other A Discussion of Methods for the Estimation of Tannin.

Recommendations.—The recommendation of the referee that further study be made to determine the limit of temperature at which soluble and insoluble matter should be determined was adopted, and the method described by him in his report for the analysis of barks, woods, etc., was ordered printed as a provisional method, work upon it to be continued until it has been further perfected. The method for the determination of acid in tannin solutions, with the alternative of using the coal-charcoal method, was continued as a provisional method, to be given further study; and the referee for 1905 was instructed to make a study of present methods of analysis of tannery yard liquors, especially spent or sap liquors. The recommendations submitted in the report for 1903 (Bureau of Chemistry Bulletin No. 73) were adopted and ordered to be embodied in the official methods. These changes relate to weighing in a weighing bottle fitted with a glass stopper, and covering the funnel with a plate during filtration to guard against evaporation.

INSECTICIDES, FUNGICIDES, AND DISINFECTANTS.

The report on this subject, by Bernard H. Smith, referee, was read by the secretary. In general the work followed closely the lines of previous years, the principal new feature being a study of disinfectants. Results of cooperative studies were given for Paris green, London purple, copper carbonate, soda lye, formaldehyde and nicotin, together with the comments of the analysts. A paper on The Determination of Lime and Sulphur in Solutions of Sulphids or Polysulphids used as Insecticides, by S. Avery, associate referee, was read by title.

There was considerable discussion of the subject of insecticides and disinfectants, attention being called especially to the poor quality of commercial formalin and copper sulphate, and to the use of sulphurous acid for bleaching dried fruits and grain (oats). The adoption of standards for these materials was advocated by several speakers.

Recommendations.—The modifications of the Avery-Beans method for determining total arsenious acid in Paris green, noted under *b*, p. 197, and *c*, p. 198, in the proceedings of the last convention,[a] were made optional methods. For the titration of arsenic twentieth-normal instead of deci-normal iodin was adopted. The electrolytic method for determining copper in Paris green and copper carbonate was made

[a] U. S. Dept. Agr., Bureau of Chemistry Bul. 81.

official, and the thiosulphate method, using twentieth-normal instead of deci-normal thiosulphate, was made optional. The volumetric silver-nitrate method, for determining cyanogen in potassium cyanid, was adopted as official, using twentieth-normal instead of deci-normal solution of silver nitrate, and the Kissling method for nicotin was also made official. The Blank and Finkenbiener peroxid method was adopted as official for formaldehyde in strong solutions and the Romjyn potassium-cyanid method for analyzing dilute solutions. The hydrogen-peroxid method, suggested by Avery, for determining sulphur in sulphur dips and similar compounds was made a provisional method, to be further tested by the association.

MISCELLANEOUS REPORTS.

Foods and feeding stuffs.—The referee on this subject stated that no cooperative work had been done and that there was no report to be made.

Food standards.—The committee on food standards presented a report prepared by the chairman, W. Frear, which was read by the secretary. It gave a brief account of a conference with representatives of manufacturers and others with respect to standards for articles not included in the schedules proclaimed November 20, 1903. No results of this meeting were given. The committee has prepared for publication at an early date tentative standards for articles belonging to the schedules of cereals and their milling products, fruits, honey, salad oils, vinegar, and fruit juices.

Medicinal plants and drugs.—L. F. Kebler, referee, submitted the report on this subject, emphasizing the need of standards and of more careful tests of these materials.

Testing of chemicals and apparatus.—The report of the committee on this subject, appointed to cooperate with a similar committee of the American Chemical Society, emphasized the need of more careful calibration of apparatus and tests of the chemicals used.

Fertilizer legislation.—H. W. Wiley, as chairman of the committee on fertilizer legislation, submitted a brief report. It was suggested that standards of purity for fertilizers and fertilizing materials might be adopted as has been done in the case of foods, and as a tentative step in this direction definitions of the terms "fertilizer" and "fertilizer ingredient" and of what constitutes adulteration were submitted. There was considerable discussion of the desirability of drafting a national law controlling interstate commerce in fertilizers, which would include definitions along the line of those enumerated, but no definite action was taken. A communication was read from E. W. Hilgard regarding the subject of uniform fertilizer legislation and the enactment of a Federal law (the latter not being regarded with favor), and referring specifically to the California fertilizer law.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

On Ritthausen's classification of the plant proteids, D. Prianishnikov (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 15–27*).—A consideration of available experimental data led to the conclusion that Ritthausen's classification of proteids needs some modification.

The author divides the proteid group into water-soluble proteids (plant albumen), proteids insoluble in water but soluble in hydrochloric acid (plant globulin), proteids soluble in 70 to 80 per cent alcohol and precipitated with a small quantity of sodium chlorid, for instance, gliadin, and proteids (rich in P_2O_5) insoluble in the above-named reagents, but capable of being extracted with alkalis and precipitated with acids, for instance, gluten casein. In addition the plants contain proteids of smaller molecular weight (peptones and albumoses), which may be regarded as intermediary products of hydrolysis, and also bodies (for instance, nucleins) with molecular weight higher than proteids.

The author believes that legumin and conglutin should not be regarded as plant caseins, but as belonging to a special group of plant globulins.

On the action of 4 per cent sulphuric acid on legumin, D. Prianishnikov (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 27–40, fig. 1*).—According to the author's experiments 4 per cent sulphuric acid when warmed with legumin causes a marked reaction. It quickly acts upon the legumin and changes it into compounds which are not precipitated with copper oxid. The author considers it probable that dilute acid causes a cleavage of the proteid molecule with the formation of amido acids. The other cleavage products are spoken of.

The occurrence of hexone bases in the tubers of potatoes (Solanum tuberosum) and the dahlia (Dahlia variabilis), E. Schulze (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 331–343*).—The investigations reported led to the conclusion that histidin and lysin are contained in the juice of potato tubers, and that arginin was present in these tubers and also in dahlias. According to the author, these facts furnish additional reasons for believing that the juice of roots and tubers contains a mixture of crystallizable nitrogenous compounds, which in composition closely resemble that present in etiolated germinating plants.

The molecular weight of glycogen, Mme. Z. Gatin-Gružewska (*Arch. Physiol. [Pflüger], 103 (1904), No. 5–6, pp. 282–286*).—The results of cryoscopic investigations, in the author's opinion, showed that the ordinarily accepted data for the molecular weight of glycogen are not trustworthy. The subject is discussed from the standpoint of physical chemistry.

Determination of phosphoric acid by the weight of the molybdic precipitate, S. Brushlinski (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 5, pp. 525–527*).—The author made 10 determinations of phosphoric acid by the Lorenz method of direct weighing of the molybdic precipitate obtained by means of a molybdic solution containing sulphuric acid and nitric acid, modifying the method by using the ordinary nitric-acid solution. Very accurate results on solutions of known composition were obtained.—P. FIREMAN.

Determination of potash, N. TARUGI (*Gaz. Chim. Ital., 34 (1904), I, pp. 324–341; abs. in Chem. Centbl., 1904, II, No. 4, p. 366*).—Organic matter in about 1 gm. of substance is destroyed by treatment with concentrated sulphuric acid, and hydrochloric acid, sulphuric acid, and ammonium salts are removed by ignition. The residue is dissolved in 10 cc. of water and the solution is mixed with 10 cc. of a 15 per cent solution of sodium persulphate ($Na_2S_2O_8$) and placed in a thermostat until its temperature becomes constant.

The mixture is allowed to stand 3 hours at 0° C. for dilute solutions, at room temperature for concentrated solutions, when by adding a small crystal of potassium persulphate the potassium persulphate in the solution crystallizes out. The persulphate content of 10 cc. of the clear supernatant solution is then determined by means of tenth-normal sodium hydroxid and compared with that of the original sodium persulphate solution used. The difference between the two, allowing for dilution, multiplied by 0.0047 and corrected for potassium persulphate dissolved (factors for which are given) represents potash present. Fairly satisfactory results were obtained with the method.

Different methods of mechanical analysis of soils and the method of double sedimentation with a small sample, SABANIN (*Pochvovyedenie* [*Pédologie*], *5 (1903), Nos. 1, 2; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5 (1904), No. 1, pp. 121–123*).—The author critically reviews various methods which have been proposed and describes the following modification of the Fadyeyev-Williams method: Four grams of soil passing through a sieve with 1 mm. holes is made to the consistency of a thin gruel, triturated with the finger 2 to 5 minutes, and transferred to a flask of 125 cc. capacity, in which it is boiled for 1 hour. For the separation of the particles 0.25 to 1 mm. in size a small sieve placed in a porcelain dish of 1½ liters capacity is used.

For the separation of the particles less than 0.01 mm. the turbid liquid is transferred by means of a siphon to a small porcelain dish, from the latter after 100 seconds into a graduated beaker (100 cc. capacity, 8 cm. high), and thence into large (1½ to 2 liters) beakers—process of double sedimentation. Toward the end the soil is triturated with the finger in both dishes in order to bring about complete separation. The separation of the particles 0.01 to 0.05 mm. is effected in a tall cylinder beaker (into which the soil was transferred from the small beaker and the small porcelain dish in order to test the completeness of the last separation) from which the turbid liquid with the suspended particles is transferred every 30 seconds into a large beaker. The same treatment is given to the residue in the large porcelain dish.

The remainder of the soil after this separation represents the particles 0.05 to 0.25 mm. in diameter. In the further division of the 0.01 mm. particles the author, besides the boiling during 24 hours usually practiced in the separation of the 0.001 mm. particles, boils the sediment in a small Erlenmeyer flask and pours the turbid liquid into 3 to 5 small beakers to the height of 4 cm., from which, after 4 hours and 48 minutes, 2 cm. of the liquid is decanted, which hastens the separation. The separation of the particles 0.001 to 0.005 mm. is made in the same kind of beaker.—P. FIREMAN.

Action of hydrochloric acid on the soil under different conditions, S. BRUSHLINSKI (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4 (1903), No. 5, pp. 517–524*).—The author compared the action of hydrochloric acid on soils under varying conditions of time of treatment, concentration of acid, and excess of acid. On the basis of his own experiments and those of other investigators he concludes that the influence of the length of time, within moderate limits, is not marked, that the effect of concentration of the acid is not considerable as long as the variations in this respect are not extreme, and that only the relative quantity of the acid and soil is decisive in respect to the amount of soil going into solution.—P. FIREMAN.

The determination of gliadin in wheat flour by means of the polariscope, H. SNYDER (*Science, n. ser., 19 (1904), No. 481, pp. 442, 443*).—Noted from another publication (E. S. R., 15, p. 849).

Gravimetric estimation of starch of flour, and of commercial starches by the G. Baumert and H. Bode methods, H. WITTE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 2, pp. 65–77*).—A critical study of methods of estimating starch.

Estimation of fat in cheese and foodstuffs, H. L. VISSER (*Chem. Weekbl., 1904, No. 29; abs. in Analyst, 29 (1904), No. 339, pp. 191–194*).—Different methods of estimating the fat in cheese and feeding stuffs were tested, and a modification of the Bondzynski method is proposed.

In the author's opinion, the latter method can not be used for feeding stuffs containing cellulose, since on boiling in hydrochloric acid these form a thick mass from which the fat can not be extracted by shaking with petroleum ether. He, therefore, used the method proposed by Berntrop for bread. Five to 10 gm. of the substance was gently boiled for half an hour with 100 cc. of 10 per cent hydrochloric acid in a beaker covered with a watch glass. After cooling, distilling with water, and filtering, the residue was washed with water until a neutral reaction was observed. The wash water was removed, the filter placed in a thimble, and dried at 100° C. in a current of gas. The fat was then estimated in the usual way by extraction with ether.

In tests with maize, linseed products, rice meal, meat meal, peanut cake, etc., it was noted that the method outlined always gave the higher results, especially in the case of samples containing gluten. The fat from the meat meal was also found to contain creatin. The fat of the peanut cake consisted almost entirely of free fatty acids. These facts may serve as an explanation of the high results given by the extraction methods. The fat obtained from linseed cake after boiling with hydrochloric acid was shown to be pure from its iodin and saponification values and its refractometer figure. For those molasses foodstuffs which contain linseed-cake meal, the only reliable method, according to the author, is that of Berntrop.

Estimation of fat in cheese, B. SJOLLEMA (*Chem. Weekbl., 1904, No. 29; abs. in Analyst, 29 (1904), No. 339, pp. 190, 191*).—Several methods of estimating the fat in cheese were compared. The author concludes that when cheese is ground with a little alcohol and brought at once into a flask with about 50 cc. of ether, allowed to stand some hours with repeated shaking, the ether filtered through a very close filter, and the fat determined, very reliable results are obtained.

The examination and valuation of culinary fats, A. JUCKENACK and R. PASTERNACK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 4, pp. 193–214*).—The investigations reported have to do especially with the analysis of butter and other fats, pure and adulterated.

The natural occurrence and synthetic preparation of mixed fatty acid glycerids, H. KREIS and A. HAFNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 11, pp. 641–669, pl. 1*).—In the authors' opinion, the investigations reported give the first satisfactory proof of the occurrence of mixed glycerids of fatty acids in animal fats.

The identification of spoiled fat in food products, F. WIEDMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 2, pp. 136–139*).—A note on the detection of spoiled fat.

The lithium method of separating saturated fatty acids, K. FARNSTEINER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 2, pp. 129–136*).—A critical study led the author to conclude that the lithium method of separating saturated fatty acids was not reliable. (See E. S. R., 15, p. 748.)

The color reactions of fat oils, H. KREIS (*Verhandl. Naturf. Gesell. Basel, 15 (1904), No. 2, pp. 225–251*).—The only difference which the author could find in 2 sorts of sesame oil was that the sort which gave an azo-color reaction became green

on the addition of sulphuric acid, while the other sort became orange. Color reaction of oils is discussed at length.

The estimation of soluble carbohydrates in foods, G. BENZ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 2, pp. 89, 90*).—A note on the estimation of soluble carbohydrates.

Concerning the identification of different sorts of cinnamon, J. HANUŠ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 11, pp. 669–672*).—The importance of estimating cinnamic aldehyde is spoken of from a number of standpoints.

Report on general work in the chemical laboratory, C. A. GOESSMANN (*Massachusetts Sta. Rpt. 1903, pp. 98–104*).—A brief statement regarding miscellaneous materials examined during the year, and notes on analyses of soils, ashes, Peruvian guano, sugar-beet refuse, and city garbage products. The sugar-beet refuse obtained in the manufacture of alcohol from beet molasses contained 7.7 per cent of water, 9.72 per cent of potash (8.36 per cent soluble), and 6.39 per cent of nitrogen (3.86 per cent in form of nitrate), but no phosphoric acid. The composition of the garbage tankage and garbage ashes was as follows:

Composition of garbage tankage and ashes.

	Tankage.	Ashes.
	Per cent.	*Per cent.*
Water	7.42	3.01
Potash	None.	5.13
Phosphoric acid	[a] 6.06	8.77
Nitrogen	5.96	None.

[a] Available 4.40 per cent.

The tankage "was obtained by heating the selected garbage in vats under pressure By this method the fats are recovered, and the organic nitrogenous matter is preserved for use as a nitrogen source in fertilizers. In this process, however, the greater part of the potash and other salines are leached out. [The ashes] represent the product obtained by the cremation of city garbage. In this material the nitrogen has been sacrificed, but the potash is retained in the ashes."

Methods and interpretation of water analysis, A. ROBIN (*Amer. Jour. Pharm., 76 (1904), No. 3, pp. 101–116*).—This article refers to the unreliability of chemical data, and gives especial attention to methods of bacteriological examination, particularly the interpretation of results.

The technical analysis of water, W. E. RIDENOUR (*Amer. Jour. Pharm., 76 (1904), No. 3, pp. 121–125*).—A scheme of analysis of water for technical purposes is briefly described.

The separation of calcium and magnesium, C. STOLBERG (*Ztschr. Angew. Chem., 17 (1904), pp. 741–744, 769–771; abs. in Chem. Centbl., 1904, II, No. 2, p. 152*).—The separation is effected as follows: Convert into sulphates and dissolve the magnesium sulphate in water, add a mixture of methyl and ethyl alcohol (10 volume per cent of the latter), which throws all calcium sulphate out of solution, the latter being collected on a filter and weighed. Evaporate the alcoholic solution of magnesium sulphate and weigh the residue.

A eudiometric method for determining calcium, barium, strontium, and potassium, and eudiometric and gravimetric methods for copper, E. RIEGLER (*Ztschr. Analyt. Chem., 43 (1904), No. 4, pp. 205–214*).—The same principle on which the method for ammonia already noted (E. S. R., 15, p. 846) is based is utilized in these determinations, viz, the insolubility of the iodate of these elements in dilute alcohol and the evolution of nitrogen when they are treated with hydrazin sulphate. Tables for calculating the results from the volume of nitrogen evolved are given.

The detection of arsenic by biological means, W. HAUSMANN (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 7–8, pp. 397, 398*).—A summary of observations on the detection of arsenic by means of *Aitpasia diaphana*, together with references to the work of other investigators.

A short method of estimating glycogen quantitatively, E. PFLÜGER (*Arch. Physiol.* [*Pflüger*], *103 (1904), No. 3–4, pp. 169, 170*).—The method described consists in heating for 2 hours 100 gm. of finely divided material in 100 cc. of 60 per cent boiled potassium hydroxid solution, cooling, and diluting with 200 cc. sterilized water and 400 cc. of 96 per cent alcohol. After the suspended material has settled the solution is filtered and the precipitate washed with a mixture of 15 per cent potassium hydroxid solution and 96 per cent alcohol 1:2, and then with 66 per cent alcohol.

The precipitate (with the filter paper) is boiled in water and the solution neutralized. If a large amount of protein is separated a second filtration and boiling with water is necessary. Hydrochloric acid is added until the solution contains 2.2 per cent, and inverted for 3 hours. After cooling, neutralizing, and filtering the amount of sugar is estimated with a polariscope. The sugar value multiplied by the factor 0.927 gives the glycogen value.

Analyses of rocks from the laboratory of the United States Geological Survey, 1880 to 1903, F. W. CLARKE (*U. S. Geol. Survey Bul. 228, pp. 375*).—A revised edition of Bulletin 168, including nearly 300 new analyses. "In this edition the names are stated which the rocks would bear in the classification proposed in 1903 by Messrs. Cross, Iddings, Pirsson, and Washington, and set forth by Doctor Washington in Professional Paper No. 14. Mr. Clarke has also given a new computation of the average composition of rocks, closely agreeing with his former estimates, but founded upon more extensive data."

The measurement of ultramicroscopic particles with especial reference to colloid gold solutions and gold glass, H. SIEDENTOPF and R. ZSIGMONDY (*Ber. Deut. Phys. Gesell., 5 (1903), No. 11, pp. 209–216, fig. 1*).—The method of rendering visible and measuring ultramicroscopic particles has been noted from another publication (E. S. R., 16, p. 15).

Estimating the hydrothermal equivalent of a Berthelot bomb calorimeter in electrical units, W. JAEGER and H. VON STEINWEHR (*Ber. Deut. Phys. Gesell., 5 (1903), No. 2, pp. 50–59, figs. 3*).—A method of estimating the hydrothermal equivalent of the Berthelot bomb calorimeter is described, which the authors consider very accurate.

Platinum thermometers as a means of increasing the accuracy of calorimetric measurements, W. JAEGER and H. VON STEINWEHR (*Ber. Deut. Phys. Gesell., 5 (1903), No. 20, pp. 353–363, figs. 3*).—The platinum thermometer for use with the bomb calorimeter is described, which, according to the authors, makes for greater accuracy.

BOTANY.

The influence of current electricity on plant growth, G. E. STONE (*Massachusetts Sta. Rpt. 1903, pp. 13–30, figs. 2*).—After briefly describing some previous investigations on the subject, an account is given of some experiments conducted by the author under conditions resembling those which can be employed in commercial gardening. The work was carried on in a greenhouse with radishes and lettuce in boxes placed on movable trucks. The boxes were filled with a uniform quality of soil, were thoroughly insulated, and after using the soil for a few experiments it was resifted and used again.

With a few exceptions copper and zinc plates were used for electrodes, and the radish seed was sown directly in the boxes, whereas the lettuce was transplanted to

the boxes after the plants had attained a suitable size. Gravity cells were used in all cases except in experiments with the interrupted induced current, in which case sal-ammoniac cells were employed.

The different experiments are described at length, and with the radishes the results of treatment with various kinds and strengths of current are shown, 3,446 treated and 2,022 untreated radish plants being compared. The comparisons are based on the growth of the normal plants in each case and not on the total normal, since the duration of the different experiments did not entirely correspond. The results show appreciable gains and the percentages given represent a total gain for roots and tops of 27.34 per cent due to the influence of electric treatment. The growth of the tops showed a notable acceleration, being about 2.5 times as great as the increased growth shown by the roots.

The experiments with lettuce were somewhat similar in result, the increased growth being slightly higher than the average percentage given for radishes, although the acceleration was not as great as that shown in the growth of the radish tops over the roots.

The author concludes from the experiments that electricity has an accelerating effect on the growth of plants as shown by the positive results obtained in hundreds of experiments, and that the alternating current is much superior to the direct current as a stimulator of growth. A discussion is given of the manner in which electricity stimulates plants, a number of theories being presented.

The influence of the atmospherical electrical potential on plants, N. F. Monahan (*Massachusetts Sta. Rpt. 1903, pp. 31–36, fig. 1*).—A brief account is given of some preliminary experiments made to test the effect of atmospheric electrical potential on germination, growth, and development of plants. The experiments were conducted in large glass cases provided with doors fitted with rubber bands and closed so as to render them practically air-tight. The stands were insulated and arrangements made for determining the potential at any time. The cases in some instances were charged with Holtz induction machines and at other times from Leyden jars, and the growth of the plants was measured by a self-registering auxomete or by the use of horizontal microscopes.

Experiments were carried on with seeds of white clover, onion, lettuce, red clover, and muskmelon, and the effect on plant growth was studied with tomato plants, corn cotyledons, and a number of molds. It was found that the atmospheric electricity exerted a considerable influence on the germination of seeds, but did not increase to any appreciable degree the total germination, nor did it awaken the activity of seeds which had practically lost vitality due to age. Atmospheric electricity was shown to have an appreciable influence on the growth of plants, and it is believed that there is a maximum, minimum, and optimum potential which has not yet been determined. The voltage required for the maximum, optimum, and minimum is found to vary not only with different varieties or species of plants, but with different individuals of the same variety, depending upon the size, degree of development, etc.

The carbon nutrition of some plants by means of organic compounds, J. Laurent (*Rev. Gén. Bot., 16 (1904), Nos. 181, pp. 14–48; 182, pp. 66–80; 183, pp. 96–128; 184, pp. 155–166; 185, pp. 188–202; 186, pp. 231–241, pls. 7*).—After a historical summary of investigations relating to the possibility of chlorophyll-bearing plants assimilating carbon through their roots when grown in cultures containing organic compounds, the author gives the results of a prolonged series of experiments along this line. The plants experimented with were wheat, maize, buckwheat, peas, 2 varieties of beans, and the common groundsel.

In order to obtain comparable results and to eliminate a source of error, all the seeds were sterilized before germination and their roots were protected against infection by bacteria, molds, etc. The seedlings were grown in Knop's and Detmer's solutions to which were added definite quantities of glucose, soluble starch, dextrin, saccharose, glycerin, and humus compounds.

The results obtained show that glucose was readily absorbed through the maize roots with an increased growth and greater dry weight of the product. This took place whether plants were grown in light or darkness and also in the entire absence of carbon dioxid. Beets grown in the open air, when watered with glucose solutions, gave an increased dry weight as compared with others not so treated. The roots of maize and peas were found to take up soluble starch to some extent. The results with dextrin and saccharose were quite similar to those obtained with glucose. Glycerin was readily taken up by the roots of peas and lentils and transformed by the plants into reserve starch. It was less rapidly absorbed by maize roots. In the experiments with humus compounds maize took up as much as 10 per cent of its dry weight from potassium humate.

In the second part of the paper, the author discusses the influence of these carbohydrate compounds on the growth and morphological development of the plants, as well as the anatomical modifications induced in them. The effect of glucose, saccharose, and glycerin on the morphological and anatomical structure of plants was comparable in all cases where isotonic solutions were used. The author concludes with the generalization that all plants are able to secure their necessary carbon from certain organic compounds, chlorophyll and other pigment-bearing plants having in addition to this capacity the power of photosynthesis.

Investigations on the assimilation of some ternary compounds by plants, P. Mazé and A. Perrier (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 9, pp. 470–473*).—The ability of the higher plants to assimilate carbohydrates other than through their leaves has been the subject of controversy for some time, and the author gives the results of investigations in which it is shown that vetch seedlings grown in the dark are able to take up sugar from solutions in a similar way as other nonchlorophyll-bearing plants. Experiments with maize seedlings gave similar results.

After germination, plants were grown in solutions which had added to them 1 per cent each of glucose, saccharose, mannite, glycerin, and ethyl and methyl alcohol. The seedlings cultivated in the light in the solutions containing ethyl alcohol did not show any appreciable increase in weight. In the methyl-alcohol solutions the plants grew rapidly at the beginning, making a more rapid growth than the check plants. Experiments with glycerin seemed to show that this substance exerted an injurious effect on vegetation. When the maize seedlings were cultivated in solutions to which were added glucose or saccharose, the growth was much more rapid than in the other medium.

The increase in weight of the plants and the decrease of glucose and saccharose in the different solutions are shown in tabular form, indicating that normal green plants are able to assimilate sugars the same as fungi and bacteria. One important difference which exists between them is that the chlorophyll-bearing plants are able to derive their carbon dioxid from the air, while among the fungi and bacteria so far only the nitrous and nitric ferments are able to draw their carbon from the carbonic acid of the air.

Sexual reproduction in the Mucorineæ, A. F. Blakeslee (*Proc. Amer. Acad. Arts and Sci., 40 (1904), No. 4, pp. 205–319, pls. 4, figs. 5*).—This contribution is a result of several years' investigations on the part of the author on this group of molds, and treats of the production of the so-called sexual spores or zygospores which are characteristic of this fungi. After giving a historical review of the theories relating to zygosporic reproduction of the Mucorineæ and citing species in which zygospores have been reported, the author describes his observations, dividing the group into 2 forms based upon the method of zygospore formation.

The production of zygospores is said to be primarily inherent with the individual species and is only secondarily influenced by external factors. In the homothallic group, which comprises the minority of species, the zygospores are developed from branches of the same thallus or mycelium, and can be obtained from the sowing of a

single spore. In the heterothallic group, which embraces a large majority of the species, the zygospores are developed from branches which belong to mycelia of diverse character and can never be obtained from the sowing of a single spore. Therefore, every heterothallic species is an aggregate of 2 distinct strains, and the sexual strains show generally a more or less marked differentiation in vegetative luxuriance, which is designated by the author for convenience by the use of the plus and minus signs. The development of these different strains and their relation to each other are discussed at considerable length.

Summarizing the observations, the author concludes that the formation of zygospores is a sexual process; that the mycelium of a homothallic species is bisexual, and of a heterothallic species unisexual, and that the plus and minus series of a heterothallic group represent the 2 sexes. A considerable bibliography of this subject concludes the contribution.

The anatomy of leaves of British grasses, L. Lewton-Brain (*Trans. Linn. Soc. Bot. [London], 2. ser., 6 (1904), No. 7, pp. 315–359, pls. 5; abs. in Bot. Centbl., 95 (1904), No. 25, p. 659*).—The object of this paper is to present by means of diagrams and descriptions of the transverse section of the leaf, material for the identification of grasses from their vegetative characters. The first part of the paper gives an account of the general anatomy and histology of the grass leaf, dealing in particular with the general outline of its transverse section, structure of epidermis, the mesophyll, vascular bundles, etc. In the second part of the contribution about 80 species of grasses are arranged according to an artificial key based upon the anatomical structures mentioned in the preceding part, while the third part of the paper discusses the leaf structure of the different grasses in relation to their habitat.

The influence of oxygen on chlorophyll production, J. Friedel (*Bul. Soc. Bot. France, 51 (1904), No. 2, pp. 100–103*).—In continuation of experiments on the effect of atmospheric pressure on chlorophyll production (E. S. R., 14, p. 653), the author has given the results of additional experiments with other plants which tend to confirm his previous conclusions. All the plants experimented with were grown under conditions in which the atmospheric pressure could be regulated and comparisons drawn between their growth in rarefied air, in atmospheres of oxygen of varying pressures, and under normal conditions. It was found that chlorophyll production is dependent upon the absolute amount of oxygen present and is independent of the total pressure of the gas.

Report of the botanists, G. E. Stone and N. F. Monahan (*Massachusetts Sta. Rpt. 1903, pp. 9–12*).—Brief summaries are given of the principal investigations carried on by the authors during the period covered by the report. The season is said to have been a peculiar one, and the absence of many common fungi is noted, while others of little serious importance were very prevalent. Brief notes are given on the occurrence of raspberry cane blight; an unusual leaf spot of corn caused by the fungus *Helminthosporium inconspicuum;* stem rots of carnations, asters, etc.; leaf spot of English ivy due to *Vermicularia trichella*, and a leaf blight of horse-chestnut due to *Phyllosticta sphæropsoidea*. Notes are also given on the winterkilling of a number of hitherto considered hardy plants and a brief statement made regarding the experiments conducted at the station on the effect of electricity on plant growth.

FERMENTATION—BACTERIOLOGY.

Report of the Agricultural Bacteriological Laboratory of the Ministry of Agriculture for 1901, A. Theoktistov (*Selsk. Khoz. i Lyesor., 211 (1903), Nos. 10, pp. 184–208; 11, pp. 285–316*).—Investigations pursued during the period covered by the report embrace the following: Bacteriological investigations of herring brine, virulence of bacteria which kill mice, fermentation of tobacco, lactic-acid investiga-

tions, pure cultures for Emmenthaler cheese, studies on properties of Russian export butter, laboratory work in zymology, the application in wine making of cultures of yeast, investigations of disease in faulty wines, selection and improvement of yeast, and instructions for the use of pure yeasts.—P. FIREMAN.

An experimental study of the chemical products of Bacillus coli communis and Bacillus lactis ærogenes, L. F. RETTGER (*Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 11; reprinted from Amer. Jour. Physiol., 8 (1903), No. 4, pp. 284–293*).—A report is given of studies of the colon bacillus and the closely associated *B. lactis ærogenes*, to determine some of the chemical products of these organisms.

It was found that these organisms failed to bring about a very marked decomposition in peptone bouillon. On the other hand, an egg-meat mixture underwent rapid and extensive transformation. The common products of the colon bacillus were indol, skatol, phenols, aromatic oxy-acids, skatol-carbonic acid, hydrogen sulphid, mercaptan, tyrosin, leucin, and tryptophan. Albumoses and peptone were present in very small amounts, a fact which is contrary to general belief.

It is thought that probably the bacteria peptonize proteids, but that the albumoses and peptone formed are immediately broken up by the organisms or their enzyms, and are, therefore, detected with great difficulty. *B. coli communis* caused more rapid and profound decomposition than *B. lactis ærogenes*, the former producing its optimum results within 2 or 3 weeks, while for comparable results the second organism required from 8 to 10 weeks.

When bacterial digestion progressed beyond a certain point the intermediate products, such as peptone, amido acids, etc., gradually disappeared from the mixtures. Indol persisted for a longer time. The disappearance of the intermediate products is thought to be due to their further cleavage and the formation of still simpler bodies yielding ultimately carbon dioxid, methan, etc.

Studies of media for the quantitative estimation of bacteria in water and sewage, S. DE M. GAGE and G. O. ADAMS (*Reprinted from Jour. Infectious Diseases, 1 (1904), No. 2, pp. 358–377*).—Attention is called to the fact that the media in general use for quantitative work give inconstant results in determining the total number of bacteria in a given volume of water. In addition, different results are given for different classes of water, periods of incubation, etc. The authors present a number of facts having an important bearing on the composition and preparation of media which, if adopted, would probably serve as a basis for improvement and more accurate methods of quantitative bacterial analysis.

Results of the investigations on composition and preparation of different media are given. It is said that standard gelatin and agar beef broth are sources of considerable variation. The amount of nutrient matter in beef infusion made by the usual methods varies through wide limits. Of the 2 best commercial peptones, Merck's and Witte's, the higher bacterial counts were obtained on media made from the latter.

Studies made of plain agar with various kinds of natural water showed that, in a majority of cases, the bacteria naturally present in a given water will develop in greatest numbers in a medium made with the same water. Salts naturally present in commercial agar have a detrimental effect which may be overcome by washing out the salts in a preparation of the medium. Media made with glycerin will develop more bacteria than the same media without it. The pure cultures of different kinds of bacteria on standard gelatin, agar, or Nährstoff agar, the highest counts were obtained on gelatin and the lowest on Nährstoff. A reduction in the amount of Nährstoff in the Nährstoff agar from 1 per cent to 0.5 per cent resulted in a considerable increase in the number of bacteria observed in various waters. When cooked in alkaline solutions, the albumoses of Nährstoff undergo changes in composition which render them better food material for bacteria than is the case with the commercial product.

In studying the efficiency of waters in removing bacteria when efficiency is determined by the counts of different media, there was found to be a wide variation between the media used. With gelatin and Lawrence agar the ratio was less variable than between different lots of other media.

The writers are convinced that a uniform system of nomenclature should be adopted and the names applied to the various media should convey definite information as to their composition, method of preparation, etc.

The activity of bacteria in the soil, O. BAIL (*Sitzber. Deut. Naturw. Med. Ver. Böhmen, n. ser., 23 (1903), pp. 296–298*).—A popular account is given of the action of bacteria in soils, especial attention being given to the nitrogen-assimilating organisms.

The differential diagnosis of some pathogenic bacteria, OMYELYANSKI (*Arch. Biol. Sci.; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5 (1904), No. 2, pp. 288, 289*).—The author proposes the utilization of the increased alkalinity of the medium when bacteria are grown in it as a means of the differential diagnosis of species.

He introduces into the medium sodium formate and phenolphthalein. In the decomposition of the sodium formate, sodium carbonate is produced and the medium becomes more and more alkaline with the increased growth of the bacteria. Cultures of different species of bacteria display different rates and intensity of coloration, and it is believed that this may serve as a convenient method of recognizing species.—P. FIREMAN.

The nitrifying organisms in sewage filters, SCHULTZ-SCHULTZENSTEIN (*Tech. Quart., 17 (1904), No. 2, pp. 186–203*).—The results of a bacteriological study at the sewage-disposal works at Berlin are given. The organisms were isolated by the methods suggested by Winogradsky and their action studied, comparisons being made with the nitrifying organisms present in the soils of cultivated fields.

Nitrifying organisms were found present, and for their isolation the silica-jelly media of Winogradsky is strongly recommended. The organisms were introduced by the sewage into the filters, and they were also found present in Berlin spring water and tap water. No other nitrifying organisms than those described by Winogradsky were found on the coke of the biological filters. The action of the organisms on the sewage is described at length and notes given on some of their biological characteristics.

Notes on Saccharomyces anomalus, K. SAITO (*Jour. Col. Sci. Imp. Univ. Tokyo, 19 (1904), Art. 18, pp. 14, figs. 4*).—The author reports having isolated from sake mash the fungus *Saccharomyces anomalus*. The morphology and physiology of the yeast are described, its fermentation products and temperature relations being noted.

Notes on some ferments of diseased wines, P. MAZÉ and P. PACOTTET (*Ann. Inst. Pasteur, 18 (1904), No. 4, pp. 245–263, pl. 1*).—The results of a study of the ferments of spoiled wines begun in 1900 are given. About 20 species of bacteria were isolated and studied. These caused bitter wines, turned wines, broken wines, etc. The methods of isolation, cultivation, and the physiological characteristics of the different ferments are described. The causes of the presence of these organisms and the manner in which they bring about changes in wines are discussed.

The effect of certain poisons on inorganic ferments, C. JONES (*Chem. News, 1903, pp. 184–187; abs. in Bot. Centbl., 95 (1904), No. 22, pp. 582, 583*).—A review is given of the work of Bredig and von Berneck on the so-called inorganic ferments, which consist of finely divided metals, such as platinum, silver, gold, etc.

These form the so-called colloidal solutions which have the power of accelerating the oxidation of alcohol, decomposition of calcium formate, carbon dioxid, and hydrogen in the same manner as certain bacteria. They also cause the inversion of cane sugar and split up hydrogen peroxid into water and oxygen like certain ferments. Hydrocyanic acid, sulphuretted hydrogen, carbon monoxid, phosphorus, mercuric chlorid, etc., when supplied to colloidal solutions retard or prevent their action.

After standing some time the colloidal solutions recover from the inhibiting effect of hydrocyanic acid and some others, but from iodin compounds there appears to be no recovery. The action of these poisons toward the inorganic ferments is quite similar to that upon ferments in general.

The occurrence in fungi of ferments which break down amids, K. SHIBATA (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 7-8, pp. 384-394*).—Experiments are reported and discussed.

The formation of toxic products by vegetable enzyms, C. A. BROWNE, Jr. (*Science, n. ser., 20 (1904), No. 501, pp. 179-181*).—In the course of experiments with sugar cane the author reports having frequently observed that cane which had been sterilized by steaming suffered a more rapid deterioration through attacks of molds and bacteria than raw cane. Further, it has been observed that juice from the upper green portion of the living cane is more resistant to fermentation than juice from the riper joints further down. The juice from the top of the cane undergoes a rapid darkening after pressing, while that from the middle and bottom exhibits such a change to a much less degree, and the juice from steamed cane exhibits no change in coloration whatever.

The change in color is attributed to the action of the oxidizing enzyms, and that such bodies do occur in the sugar cane is readily shown. From the association of the coloration phenomena with resistance to fermentation, it is concluded that the dark-colored oxidation products produced by enzyms may have a toxic or germicidal action. That they do possess this characteristic is shown by experiments which are described at some length.

The endosperm enzym of the date palm, R. H. POND (*Science, n. ser., 20 (1904), No. 501, p. 181*).—A preliminary report is given of studies on the enzym found in the endosperm of the date-palm seed. The method of isolation and some of the characteristics of the enzym are described.

Micro-organisms of soil and human welfare, T. J. BURRILL (*Science, n. ser., 20 (1904), No. 509, pp. 426-434*).—In a presidential address read before the American Microscopical Society, the author calls attention to a number of species of soil bacteria which have an important bearing on the human race. Particular attention is paid to the nitrifying organisms and the tubercle bacteria.

The behavior of enzyms, especially chymosin, chymosinogen, and antichymosin toward concentrated electric light, S. SCHMIDT-NIELSEN (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 7-8, pp. 355-376, figs. 6*).—Experiments are reported and discussed. According to the author, strong light with a constant quantity of ultraviolet rays furnishes a new means for studying ferments.

ZOOLOGY.

Experiments with the infection method of Löffler for combating the mouse plague according to a new method of application, J. PFREIMBTNER (*Fühling's Landw. Ztg., 53 (1904), Nos. 16, pp. 619-627; 17, pp. 662-667*).—Attention is called to the great damage caused by field mice in various parts of Europe. In some years enormous losses are due to the attacks of these pests. In the author's opinion the infection method of Löffler will give good results in most cases when applied thoroughly and conscientiously. In some instances of failure it is believed the negative result was due to the use of material which contained no virulent culture of the organism. The contention that the organism of mouse typhus is identical with the paratyphoid bacillus of man is combated. It is argued that these organisms differ in biological relation and in their chemical reaction.

Plague of field mice in France, G. H. JACKSON (*Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 288, pp. 67, 68*).—Notes are given on the depredations com-

mitted, especially in southern France, by field mice. An account is presented of experiments in infecting mice over large areas of land. This method of destruction has been carried out systematically on an area of 2,800 acres and has proved successful, while the fowls and other farm animals did not become infected.

The extermination of rats, A. NEGREIROS (*Jour. Agr. Trop., 4 (1904), No. 33, pp. 76, 77*).—Attention is called to the great depredation of these animals, especially in St. Thomas, where they destroy a considerable portion of the cacao and some other crops. The virus prepared by Danysz for use in destroying these pests was tried with negative results. Attention will be given to a test of the method proposed by the Pasteur Institute.

The Parker rabbit exterminator (*Queensland Agr. Jour., 15 (1904), No. 2, pp. 613, 614, fig. 1*).—A description is given of a contrivance which has been devised and tested in the destruction of rabbits. The effectiveness of the device depends on the habit of rabbits in traveling along newly turned furrows. A small receptacle containing a quantity of fluid poison sufficient to kill about 300 rabbits is placed underground in the floor of the furrow. The weight of the rabbit upon a small platform attached to the apparatus is sufficient to discharge a certain quantity of the poison upon the fur of the rabbit through a small nozzle. The poison is mixed with some sugar in order to make a sticky fluid. The rabbits are poisoned when they lick this material from their fur.

Dingo trapping (*Jour. Dept. Agr. West. Australia, 10 (1904), No. 2, pp. 82–84, pl. 1*).—Notes are given on methods of placing traps so as to catch the dingo or wild dog of Australia. This animal commits considerable depredations upon sheep flocks and is so wary that special methods are required in trapping it successfully.

Importation of insectivorous birds, B. O. CLARK (*Hawaiian Forester and Agr., 1 (1904), No. 3, pp. 53, 54*).—The author refers briefly to the beneficial effects of certain birds on account of their feeding habits. It is recommended that Brewer's Blackbird, which is especially common in southern California and which shows more or less insectivorous habits, should be introduced for the purpose of combating the leaf hopper pests of sugar cane and other insects. As stated by another author, however, this bird frequently attacks grain crops, and the possibility of its being injurious to rice in Hawaii must be considered.

The sparrow plague and its remedy, A. BATHGATE (*Trans. and Proc. New Zealand Inst., 36 (1903), pp. 67–79*).—The literature relating to the English sparrow is critically reviewed. The bird is considered as doing far more harm than good, and the means for its destruction are therefore discussed. In combating the English sparrow the author believes that little hope is to be entertained from the method of offering bounties. The 2 methods recommended are systematic trapping by expert bird catchers and the introduction and encouragement of the natural enemies of the English sparrows, such as owls, jays, magpies, shrikes, and other birds. Under the exercise of proper precautions poisoning may also be effective.

The birds of Erie and Presque Isle, Erie County, Pennsylvania, W. E. C. TODD (*Ann. Carnegie Mus., 2 (1904), No. 4, pp. 481–596, pls. 4*).—A study was made of the bird fauna in the northwestern portion of the State of Pennsylvania, particularly about the town of Erie and on Presque Isle. The chief purpose of this study was to determine the number of species present, their distribution, and the influence of Lake Erie and local conditions upon this distribution. Notes are given on the frequency of occurrence and other biological data concerning all species which are reported.

The marsh hawk and its beneficial effects in the destruction of mice (*Com. Parasit. Agr. [Mexico], Circ. 10, pp. 5, fig. 1*).—Brief notes on the feeding habits and economic importance of this bird.

Sawdust and fish life, A. P. KNIGHT (*Trans. Canad. Inst., 7 (1904), III, No. 15, pp. 425–466, figs. 6*).—On account of the abundant occurrence of sawdust in streams,

the author has been led to investigate the effect of its occurrence on fish life. Numerous experiments were conducted with various kinds of sawdust in aquaria where the conditions could be controlled, and it was found that strong sawdust solutions at the bottom of an aquarium poisoned fish through the agency of compounds dissolved from the wood cells. The overlying water in such an aquarium did not at first kill fish, but after about a week it would do so, the dissolved oxygen having been exhausted.

Bacteria were found to multiply enormously through all parts of the aquarium, and through oxidation changed the poisonous extracts to harmless compounds. Subsequent aëration and sedimentation of sawdust water purifies it so that fish can live in it without injury. It was found that adult fish, as well as black bass fry, refused to be driven into pine extracts in the bottom of the aquarium after they had experienced its poisonous effects, and from this it is inferred that fish would desert a river polluted with such sawdust.

The author states that no stream can be pronounced offhand as poisoned by sawdust, but each must be studied by itself. The chief things to be considered are the quantity of the sawdust and the volume of water into which the sawdust is discharged.

A fish which attacks cows, A. MIRANDA (*Jour. Agr. Trop., 4 (1904), No. 38, pp. 235, 236*).—The fish belonging to the species *Serrasalmo piraya* occurs very abundantly in parts of the Amazon, and during flood time is found in great numbers in the shallow overflow water. When cows stand in such water during the heat of the day they are attacked upon the legs and udder by the fish. Great injury is done to these parts, and in many cases cows are rendered useless for dairy purposes or are killed outright. In one instance a dairyman lost 400 cows from this cause in a single season.

Zoological yearbook for 1903, P. MAYER (*Zool. Jahresber., 1903, pp. VIII+596*).—This report contains short abstracts of the more important investigations published during the year on the various groups of the animal kingdom. Extensive bibliographies are given in connection with each group of animals.

[Monthly bulletin of the division of zoology], H. A. SURFACE (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 6, pp. 164–192, figs. 4*).—Brief notes are given on collecting insects, spraying trees, treatment for peach-tree borers and the San José scale, nature study, game laws, and robins.

Annual report of the division of zoology, H. A. SURFACE (*Pennsylvania State Dept. Agr. Rpt. 1903, pp. 159–191*).—Notes are given on the equipment, investigations, collections, and publications of this division, together with a brief review of economic zoology in Pennsylvania and a report upon nursery inspection in the State.

METEOROLOGY—CLIMATOLOGY.

Report of the Chief of the Weather Bureau, 1902–3 (*U. S. Dept. Agr., Weather Bureau Rpt. 1902–3, pp. XLIII+308*).—The first part of this report contains an account of the operations of the Weather Bureau during the year; part 2, a list of observing stations and changes therein during 1902, and hourly averages of atmospheric pressure, temperature, and wind from the records of automatic instruments at 28 stations; part 3, monthly and annual meteorological summaries for 165 Weather Bureau stations; part 4, monthly and annual means and extremes of temperature and dates of first and last killing frosts, 1902; part 5, monthly and annual precipitation, 1902; and part 6, miscellaneous meteorological tables and reports.

Observations and investigations made at the Blue Hill Meteorological Observatory, Massachusetts, U. S. A., in the years 1901 and 1902, A. L. ROTCH (*Ann. Astron. Obs. Harvard College, 43 (1903), pt. 3, pp. 115–239, pls. 4; rev. in Science, n. ser., 20 (1904), No. 503, pp. 240, 241*).—This is a report dealing with addi-

tions to equipment, kite observations on land and sea, with descriptions of kites and instruments used in exploration of the air, and studies of the effect of meteorological conditions on audibility.

Climate: Its physical basis and controlling factors, W. L. MOORE (*U. S. Dept. Agr., Weather Bureau Bul. 34, pp. 19, fig. 1*).—A reprint of an article prepared for Encyclopedia Americana.

Smoke as a preventive of frost, T. HAYNES (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 285, p. 1040*).—A brief note on successful experiments in France in preventing frost in vineyards by means of smudges, especially those produced by burning gas tar.

Annual precipitation in Oklahoma, C. M. STRONG (*Oklahoma Sta. Rpt. 1904, p. 63*).—A summary of all available data for annual precipitation during the period 1889–1903 at 25 places in the State.

SOILS.

Some observations on the "ortstein" formations of southern Russia, V. N. SUKACHEV (*Pochvovyedenie [Pédologie], 5 (1903), pp. 213–220; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, p. 77*).—The author describes "ortstein" formations observed by him at 6 places in the Kharkov and Kursk governments. The fact of the occurrence of "ortstein" in those localities shows, according to the author, that for its formation an abundance of water is not necessary, the humidity which is found in the forest soils of the steppes being sufficient.

In all places where "ortstein" was observed the soils appeared to have been leached out and had been covered by woods, probably oak, while the subsoils were to a great extent sandy. Thus the processes of "ortstein" formation were here favored by the sandy nature of the soil and the oak forests, the latter yielding a litter rich in tannic acid. The mere presence of "ortstein," in the absence of all other soil characteristics, is, according to the author, a sure indication of the existence of woods.—P. FIREMAN.

Laterites and red soils of tropical and subtropical latitudes and allied soils of temperate latitudes, K. D. GLINKA (*Pochvovyedenie [Pédologie], 5 (1903), No. 3, pp. 235–264; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 2, p. 241*).—The author discusses the occurrence of laterites under evergreen forests and savannahs, the formation, composition, and structure of such soils, and the changes which they undergo under different conditions of climate, etc. To the article is appended a list of 50 titles not included in the bibliography of Dubois on this subject.—P. FIREMAN.

The useful properties of clays, A. S. CUSHMAN (*U. S. Dept. Agr., Bureau of Chemistry Circ. 17, pp. 12*).—This circular discusses the formation of clays, and the production and importation of clays, and describes the kinds and physical properties of clays, including plasticity, binding power (tensile strength), slaking, air shrinkage, firing qualities (distortion, fusibility, and color), and absorptiveness. Notes are also given on the various uses of clays and on testing and examination of clays.

The humus calcareous soils (rendzinas) of the Vistula region, J. MASANOVSKI (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 5, pp. 528–545*).—This article presents a survey of the literature on a kind of soil very widely distributed in Poland and known there under the names of "rendzina" and "borovina." These soils have been formed on rocks rich in lime, e. g., on limestones and marls, with the simultaneous action of leaf-bearing forests. They are rich in humus (3 to 8 per cent), in most cases very heavy, but very fertile. They are best adapted to the cultivation of wheat and barley.—P. FIREMAN.

The effect of the long-continued use of sodium nitrate on the constitution of the soils, A. D. HALL (*Jour. Chem. Soc. [London], 85 (1904), No. 501, pp. 964–971*).—"By the mechanical analysis of soils from the five experimental fields at

Rothamsted, on which there are plats manured with sodium nitrate, it is found that the soil of these plats generally contains a lower proportion of the finest 'klay' fraction than does the soil of adjoining plats which have been either unmanured or have received ammonium salts in place of sodium nitrate. This result was most manifest in the mangel field where cultivation is frequent, and was not apparent at all in the grass field where the turf protects the soil from the washing action of the rain.

"The removal of the finest particles from the surface soil is attributed to deflocculation induced by the use of sodium nitrate, and followed by the washing of the finest particles into the subsoil. This hypothesis is confirmed by chemical analyses of the 'klays' separated in the mechanical analysis, by the examination of some of the subsoils, which are found to be richer in fine particles beneath the soils receiving nitrate, and by the condition of the soils in the field, which show every evidence of deflocculation."

Soil fertility in the light of recent investigations, S. BOGDANOV (*Selsk. Khoz. i Lyesov., 211 (1903), Nov., pp. 249–284*).—The author reviews the work of Dyer (E. S. R., 5, p. 1013) on acidity of root juices; of Prianishnikov, Kossovich, and Shulov (E. S. R., 13, pp. 235, 934; 14, pp. 343, 427) on the assimilation of the phosphoric acid of raw phosphates by different plants; of Schloesing and Paturel (E. S. R., 13, p. 1029; 14, pp. 127, 233, 341; 15, p. 760) on the phosphoric acid of soil solutions; of Fesca[a] on the solubility of soil constituents in water; of Czapek and Kohn[b] on root secretions; and others, in so far as these investigations relate to the alleged power of plants to assimilate difficultly soluble soil constituents by means of acid secretion of their roots.

He reaches the conclusion that in the strict sense there are no root secretions either acid or alkaline, but that plant roots in taking up the necessary constituents exercise a selective influence on the soil solution which varies with different plants and stages of growth and with the character of the soil. The plants undoubtedly play a part in dissolving substances from the soil, but this consists mainly in selecting the needed plant food from the soil solutions, thus helping the soil water to dissolve new quantities of nutritive substances. The physiological residues of the salts utilized by the plants may play a part, dependent upon the needs of the plants for nutritive substances and upon the chemical peculiarities of the soil. A part may also be played by the carbon dioxid which is exhaled by the roots of different plants in varying amounts.

It is pointed out, however, that the physiological residues of the salts, as well as the carbon dioxid exhaled by the roots, may be of importance only in the artificial conditions found in most experiments, especially such as prevail in sand cultures. In normal soils there are usually present plenty of substances which rapidly neutralize the physiological residues, and, since carbon dioxid is formed in normal soils in abundance at the expense of decomposing organic substances, the additional carbonic acid exhaled by the roots can scarcely be of much consequence.—P. FIREMAN.

Investigation of some chemical and physical properties of the separate products of the mechanical analysis of podzol and loess, D. P. MAZURENKO (*Inaug. Diss., Munich; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5 (1904), No. 1, pp. 73–75*).—The author employed the Fadyeyev-Williams method of mechanical analysis and operated on a rather large scale in order to obtain each fraction in sufficient quantity. The experiments were made with two strikingly different soils, a loess from the basin of the Donetz River and a podzol from the farm of the Moscow Agricultural Institute.

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[a] Jour. Landw., 1873, p. 459; Jahresber. Agr. Chem., 16–17, 1873–74, p. 126.

[b] Jahresber. Wiss. Bot., 29 (1896), p. 321; Landw. Vers. Stat., 52 (1899), pp. 315-326.

The data regarding the chemical composition show that in the mechanical fractions of both the loess and podzol the amount of silica decreased and the other chemical constituents (alumina, ferric oxid, lime, magnesia, etc.) increased as the size of the particles decreased. The data further showed that all the mechanical products of the loess were richer as regards chemical composition than the corresponding products of the podzol, which fact is the more important as the quantity of the very small particles in the loess (24.85 per cent) considerably exceeds that in the podzol (3 to 5 per cent).

The specific gravity of the loess itself and of its mechanical fractions is greater than in the case of podzol. In both the soils the specific gravity of the mechanical fractions increased as the size of the particles decreased. To gain an idea of the volume-weight, compactness, and porosity, the author made briquettes from the separate mechanical fractions which were weighed and measured before and after drying. It was found that as the size of the particles decreased the quantity of the water evaporated from the briquettes increased, while the volume diminished, the decrease in volume being greatest in the products of the loess. The data showed that the volume-weight of the mechanical fractions of the loess increased as the size of the particles diminished, while in those of the podzol the contrary holds, except in the case of the finest particles (clay). The loess and its mechanical products showed a larger volume-weight than the podzol and its products. The porosity of the separate mechanical products was inversely as their volume-weights. Thus, in the loess the porosity diminished with the decrease in the size of the particles, while in the podzol it increased with the decrease in the size of the particles down to the finest particles, which showed a small relative porosity.

These differences in the properties of the mechanical fractions of the loess and podzol are accounted for, in the opinion of the author, by the difference in the form of the particles. In the loess and its mechanical products flat and scaly particles predominate, while in the podzol and its mechanical products, the clay excepted, spherical particles of quartz predominate. Flat particles are more easily wetted and possess a greater power of cohesion, thus causing greater compactness (volume-weight) and less porosity.—P. FIREMAN.

Experiments on the relative fertility of soil particles of different grades, D. L. RUDZINSKI (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscow*], *9* (*1903*), *No. 2, pp. 172–234, pls. 5*).—The author prepared large quantities of the different sizes of soil particles for use in his experiments by means of the Fadyeyev-Williams method, which is as follows:

One kilogram of the air-dry soil is sifted through a sieve with holes 3 mm. in diameter. The lumps which do not pass through the sieve are disintegrated by rubbing in a mortar with a rubber-tipped or wooden pestle and again sifted. From the part of the soil which contains no particles larger than 3 mm. an average sample weighing 100 gm. is selected, while the part remaining on the sieve is freed from the finer grains clinging to it by boiling with water in a dish and then washing with pure water. The washed coarse grains are dried, sorted by sieves with holes of 10 and 5 mm. in diameter, and weighed.

A part of the sample, with particles not exceeding 3 mm. in diameter, is boiled with water for 6 hours in an enameled iron dish covered with a watch glass, allowed to cool, and washed into a sieve with holes 0.25 mm. in diameter placed in a large porcelain dish. The particles remaining on the sieve after pressing with a rubber-tipped glass rod and washing, are dried at 100 to 110°, again sifted, and then sorted by means of 1 mm. and 0.5 mm. sieves into 3 grades: Coarse sand with particles 1 to 3 mm., medium sand, 1 to 0.5 mm., and fine sand, 0.5 to 0.25 mm. in diameter. Each of the grades is dried at 100 to 110° and weighed.

Those particles of the soil which passed through the sieve with holes 0.25 mm. in diameter and were collected in a porcelain dish are allowed to settle during 5 minutes in a layer of water 10 cm. in height, as follows: The contents of the dish are transferred, in successive portions, to a beaker of 200 to 250 cm. capacity, which is provided with a mark 10 cm. from the bottom. The beaker is each time filled to the mark, the particles allowed to settle during 5 minutes, when the particles which have not settled are decanted into a glass dish with vertical walls, of 3 to 3.5 liters capacity (also provided with a mark 10 cm. from the bottom). The particles which settle at the bottom of the beaker have a diameter 0.25 to 0.01 mm. On drying the particles 0.25 to 0.05 mm. in diameter can be separated from those 0.05 to 0.01 mm. in diameter by Schöne's apparatus, so regulating the stream of water that its velocity in the cylindrical part of the funnel-shaped vessel is equal to 2.11 mm. a minute.

The liquid with the suspended particles obtained by pouring off after 5 minutes settling is allowed to stand in the glass dish during 24 hours. The particles which remain suspended (less than 0.001 mm. in diameter) are siphoned off into a tall glass cylinder with a capacity of 8 liters. The residue in the dish is once more stirred up with water added to the mark and again allowed to settle and the supernatant liquid decanted.

To insure a complete separation of the very fine particles it is sometimes necessary to boil the residue remaining in the glass dish with water for 12 hours, using for this purpose an enameled iron dish. In that case the contents of the iron dish after digestion are passed through a sieve with holes 0.25 mm. in diameter, in order to break the aggregates which sometimes form in boiling, into a glass dish with a mark, like the one mentioned above, but of less capacity.

After standing 6 hours the coarsest particles settle at the bottom of the glass dish while the finer particles, with an admixture of fine silt, remain suspended. The suspended particles are siphoned off into another dish and allowed to settle during 24 hours. The turbid liquid containing the fine silt is siphoned into the tall cylinder which already contains the main bulk of the silt of the sample. The coarser particles in the 2 dishes are treated with successive portions of water until the liquid above them, after settling, contains little suspended matter. The sediments thus obtained are then transferred with the aid of small quantities of water into beakers, 1 to 2 cc. of a saturated solution of calcium chlorid are added, and when the solutions above the residues have become clear the latter are filtered through weighed filters. The washing to remove the calcium chlorid adhering to the residues is continued until the filtrate begins to pass through turbid. The residues are then dried at 100 to 110° and weighed.

Finally the liquid in the tall cylinder containing the silt is treated as follows: After a considerable quantity of the liquid has been transferred from the dishes into the cylinder 20 to 25 cc. of a saturated solution of calcium chlorid are added, the liquid is stirred up and allowed to stand for some days until the silt settles at the bottom and the supernatant liquid becomes clear. The clear solution is siphoned off and fresh portions of the liquid, from the dishes, containing silt are transferred to the tall cylinder and treated in the same way. The silt, upon removal of the clear solution, is, as was the case with the coarser particles, washed with the aid of a little water into a beaker, treated with 1 to 2 cc. calcium chlorid, filtered through a weighed filter, dried, and weighed.

In obtaining the mechanical constituents of the soil for his experiments the author had to avoid the operation of boiling since he found that plants develop better on soils which were subjected to boiling for 6 hours than on the same soils not so treated. In order to disintegrate the small lumps he poured the particles of the soils which passed a sieve with holes 3 mm. in diameter into a Schöne apparatus filled with 300 cc. of water and agitated them by sucking air through the apparatus. Passing the

current of air during 4 hours was sufficient for complete disintegration of the various soils with which the author experimented. After the agitation by the current the liquid, together with the sediment, was brought into a sieve with holes 0.25 mm. in diameter, where the sandy part of the soil was separated. The further treatment of the soil was according to the Williams method.

In the author's experiments oats were raised in 5 kg. pots filled with a mixture of sterile sand and soil particles of different sizes prepared by the method described. In the first series the mixture consisted of the sand and so much of the mechanical element (silt, fine dust, medium dust, large dust, together with the sandy dust) as was obtained from 2 kg. of the soil. In the second series of experiments the necessary quantity of sand was mixed with normal soil and with the same deprived of one or more of the mechanical grades of particles. In both series of experiments the soils used were a clayey chernozem and a peaty clay. The third series of experiments was carried out with equal quantities of the different mechanical elements (each vessel receiving 250 gm. of the element in question and 4,500 gm. of sand). Parallel experiments in the case of each element were carried out with nitrogen and potash and with nitrogen and phosphoric acid.

In this series of experiments as well as in the following series the mechanical elements of the upper layer of a podzol soil and of the parent rock under it were investigated. The phosphoric acid and the potash in the silt and coarser particles, and the nitrogen, phosphoric acid, and potash in the crops of oats obtained were determined. In the fourth series of experiments sand and such amounts of the corresponding element were used that in the pots fertilized with nitrogen and potash the phosphoric acid amounted to 0.25 gm., and in the pots fertilized with nitrogen and phosphoric acid the potash content also amounted to 0.25 gm.

The following are some of the conclusions drawn: (1) The total contents of potash, phosphoric acid, and nitrogen in the mechanical elements of the soils investigated decreases with the increase of their size; (2) assimilable substances for the plants are contained not only in the silt, but also in the coarser grades; (3) since the very fine particles are present in the majority of soils in small quantities the fertility of soils depends largely upon the coarser particles; (4) the mechanical elements even of soils of a like geological origin are unlike in their chemical composition and in the availability of their plant food; hence it is impossible to judge of the fertility of a soil from its mechanical composition.—P. FIREMAN.

The mechanical analysis of soils and the composition of the fractions resulting therefrom, A. D. HALL (*Jour. Chem. Soc.* [*London*], *85* (*1904*), *No. 501*, *pp. 950–963*).—The author investigated the effect on the mechanical analysis of soils of the preliminary treatment with dilute acid followed by ammonia, proposed by Schloesing.

For the separation into fractions, Osborne's method of sedimentation was adopted, the soil being separated into two fractions by sieving and into five by sedimentation. He found that the raw soil rarely yielded as much of the finest fraction, for which the name "klay" is proposed, as was given by the same soil after washing with acid, the difference being greatest with soils rich in humus, the reason probably being that the humates, which act as a weak binding material, are decomposed by this treatment. Soluble salts, which might interfere, are also removed.

The difference shown by the two methods, however, practically disappears when the soil has long remained unmanured or has been deflocculated by the continued use of saline fertilizers. The Schloesing method consequently reveals the original character of the soil, irrespective of its manuring.

Investigations on the absorbent power of cultivated soils, C. DUSSERRE and T. BIELER (*Ann. Agr. Suisse*, *5* (*1904*), *No. 3*, *pp. 110–119*, *figs. 6*).—The history of the study of this property of soils from the time of its discovery by J. Gazzeri in

1819 is briefly reviewed, and experiments in glass cylinders filled with successive layers of fine soil (1 mm. particles) separated by filter paper to test the rate of absorption and depth of penetration of phosphoric acid in superphosphate solution, and potash in chlorid solution, are reported. The surface of the soil in the glass cylinders was covered with a filter paper and the solutions were poured on slowly, followed by distilled water, until a given amount had run out through the tube at the bottom of the cylinder.

After a period of a month the successive layers of soil were removed, dried, and analyzed. In the experiments three soils—siliceous clay, calcareous clay, and peat—were used. Phosphoric acid was applied at the rate of 3,410 kg. per hectare, the potash at the rate of 2,050 kg. per hectare. The phosphoric acid descended to a greater depth and a larger amount passed through in case of the peat than in case of the other soils, the siliceous clay standing next in these respects and calcareous clay last. In the latter all of the phosphoric acid was retained comparatively near the surface and none passed through.

The potash was more uniformly distributed through the different layers of the soils and in case of peat was to a large extent removed by repeated washing.

The results indicate in general that 96.6 per cent of the phosphoric acid and 72 per cent of the potash applied on the surface of soils is rendered insoluble before a depth of 8 cm. is reached.

Influence of the humidity of the soil at various periods of development of buckwheat on the yield of grain, I. A. PULMAN (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, pp. 68–72*).—Phenological observations by the author on the growth of buckwheat during 20 years have led to the conclusion that good yields of grain were obtained only when there was a sufficient rainfall during the period between blossoming and fruit forming.

To test the validity of this conclusion he made the following vegetation experiments in 1903: Four pots were used and in all the optimum humidity, 34 per cent, was at first maintained. The buckwheat plants (six in each pot) developed uniformly until the period of blossoming, at the beginning of which the humidity in one pair of the pots was maintained as before at 34 per cent, while in the other it was reduced to 24 per cent. As soon as the seed began to form, the humidity content was again altered; in one pot of the pair with 34 per cent the humidity was reduced to 24 per cent, while in one vessel of the pair with 24 per cent the humidity was raised again to 34 per cent.

The larger total yield and the greater number of good seeds were obtained where the abundant supply of water was maintained, and in the author's opinion furnishes a complete corroboration of his conclusion that for the yield of buckwheat seed the humidity of the soil during fruit-building is of primary importance.—P. FIREMAN.

On the moisture of the soil, N. A. DIMO (*Pochrovyedenie [Pédologie], 6 (1904), No. 1, pp. 45–58*).—Observations were made by the author simultaneously on meadow and forest soils of the same character, viz, heavy clay alluvium which becomes more friable at a depth of 65 to 85 cm. and then passes into a yellowish-white river sand. The surface is quite level, and the underground waters are rather near the surface.

Twenty-eight observations made during a period of 103 days (from May 21 to September 1) at depths varying from 10 to 140 cm. are reported. The mean percentages of moisture to a depth of 25 cm. was in meadow soil 18.32 per cent, in wood soil 21.51; in the soil layer at depths of 50 to 140 cm., 18.63 in meadow soil, 14.29 in forest soil; the average for all depths 18.53 in meadow soil, 17.30 in forest soil.

From these data the author concludes that (1) the mean values of the moisture of the soil for the entire depth and during the whole period are very close for both the meadow and the woods soil; (2) the surface layer from 0 to 25 cm. is more moist in the woods than in the meadow; (3) the deep layers, on the contrary, are more moist

on the meadow. Other observations indicated that the ground water level was reached in the meadow soil at a depth of 140 cm., but was lower in the woods soil.—P. FIREMAN.

Alkali and the treatment of alkali lands, J. S. BURD (*Idaho Sta. Bul. 44, pp. 355–367*).—A popular compilation of information on this subject preliminary to an alkali survey of the State.

FERTILIZERS.

The fertilizing value of human excrement, J. SEBELIEN (*Jour. Landw., 52 (1904), No. 3, pp. 291–300, pl. 1*).—An account is here given of pot experiments during 1902 and 1903 on oats grown in soil containing very little humus and nitrogen. In one series of experiments solid excrement, mixed with ground peat and kept for a few weeks before application, was used. In another series, urine, which had been kept for a few weeks and allowed to ferment, was experimented with.

The results of the 2 years' experiments on the same soil show that while the urine showed little fertilizing value, the solid excrement was more effective than nitrate of soda alone, thus demonstrating not only a high efficiency for the nitrogen, but also that feces are of considerable value as a source of phosphoric acid (and possibly of potash). The solid excrement was much more effective than the manure of ordinary domestic animals.

On an improved method of producing concentrated manure from human refuse, T. MACFARLANE (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 8 (1902), Sec. III, pp. 87–95, dgm. 1*).—A closet of special construction in which dried peat moss is used as an absorbent is described and the fertilizing value of the product obtained by repeated use of the moss and the dried mixture of moss and excrement is discussed. By the method described a minimum amount of absorbent (not more than one-twentieth of the resulting manure) is used and a product obtained, one sample of which, in the air-dry condition, contained 3.16 per cent of nitrogen (2.42 per cent as ammonia), 2.52 per cent of phosphoric acid, and 0.65 per cent of potash. With the addition of preservative substances—superphosphate, sulphate of potash, and gypsum—products of still higher fertilizing value were obtained.

Salt as a garden fertilizer, GIERSBERG (*Deut. Landw. Presse, 31 (1904), No. 54, p. 482; Jour. Agr. Prat., n. ser., 8 (1904), No. 28, pp. 37, 38*).—This is a brief discussion of the value and use of salt as a fertilizer for vegetables and fruits, in which it is shown that this substance has a certain indirect effect in improving the quality of such crops. The maximum amount recommended for fruit trees is ⅓ to ½ lb. per tree, according to size, and for vegetables 150 to 200 lbs. per acre.

Analyses of commercial fertilizers, H. J. WHEELER, B. L. HARTWELL, and J. W. KELLOGG (*Rhode Island Sta. Bul. 101, pp. 151–160*).—"This bulletin contains the analyses of such of the commercial fertilizers found on sale in Rhode Island in 1904 as were branded especially for potatoes and vegetables. It also contains analyses of samples of bone, tankage, muriate of potash, and nitrate of soda," and notes on valuation.

Report on official inspection of commercial fertilizers and agricultural chemicals during the season of 1903, C. A. GOESSMANN (*Massachusetts Sta. Rpt. 1903, pp. 87–97*).—A brief summary of the work of the year, containing a table showing the average composition of the fertilizers examined and a list of licensed dealers in fertilizers.

Fertilizer inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 105, pp. 101–112*).—"This bulletin contains the analyses of samples collected by the station of the brands of fertilizers licensed in 1904."

FIELD CROPS.

Report of the agriculturists, W. P. Brooks and F. R. Church (*Massachusetts Sta. Rpt. 1903, pp. 110–149*).—The work here reported is in continuation of fertilizer experiments with field and garden crops previously undertaken (E. S. R., 15, p. 139). The year's work is briefly described, and the results obtained in the different tests are reported in detail. The more important conclusions are here summarized.

Soy beans were grown in connection with the comparison of different substances as sources of nitrogen. Nitrate of soda ranked relatively lower this year than in most previous years. As compared with the no-nitrogen plats, the various substances, based on the results of this season, ranked in the following order: Barnyard manure, nitrate of soda, dried blood, and sulphate of ammonia. The general average to date, based on the increase over the no-nitrogen plats, ranks the materials as follows: Nitrate of soda, 100; barnyard manure, 77.8; dried blood, 65.1, and sulphate of ammonia, 63.6.

The results of the year indicate that high-grade sulphate of potash is superior to muriate of potash for potatoes. The two salts gave practically equal yields when used for soy beans. An untoward season vitiated the results with cabbages and onions.

For the last 6 years nitrate of soda, sulphate of ammonia, and dried blood, in amounts furnishing 60 lbs. of nitrogen per acre, have been used in addition to 30 tons of barnyard manure per acre as applications for garden crops. For the early crops, including dandelions, strawberries, peas, and beets, dried blood ranked first, nitrate of soda second, and sulphate of ammonia third; while for the late crops, including late cabbages, turnips, celery, tomatoes, and squashes, nitrate of soda ranked first, dried blood next, and sulphate of ammonia last. Sulphate and muriate of potash were tested in connection with the applications just described, and the results for the year indicated the sulphate to be better for strawberries, tomatoes, cucumbers, celery, and turnips, while the muriate gave slightly better results with dandelions, peas, and beets.

The following potash salts, in applications supplying 165 lbs. of actual potash per acre, were tested on clover mixed with timothy: High-grade sulphate, low-grade sulphate, kainit, muriate, nitrate, carbonate, and silicate. The high-grade sulphate gave the best yields of clover, being closely followed by the silicate, carbonate, low-grade sulphate, and nitrate. The heaviest timothy was produced by the kainit and muriate. The potash salts containing chlorin, especially kainit, were injurious to the clover.

Different phosphates applied in amounts giving 96 lbs. of actual potash per acre were used this year in growing cabbages. Those giving satisfactory results ranked as follows: Dissolved bone meal, South Carolina rock phosphate, raw bone meal, phosphatic slag, steamed bone meal, and dissolved boneblack. Tennessee phosphate, apatite, and Florida soft phosphate proved much inferior to all others.

The season was unfavorable to the soil test with corn, but the results showed that potash gave a much greater increase in crop than any other plant-food element. The results of a soil test with mixed grass and clover demonstrated the need of nitrate of soda for grass, and also indicated a strong tendency to render the soil acid by the continued use of nitrate of soda and muriate of potash. In this experiment lime produced a marked result in increasing the proportion of timothy in a mixture of timothy, redtop, and clover.

Grass plats receiving the first year 8 tons of barnyard manure per acre, the second year 1 ton of wood ashes, and the third 600 lbs. of ground bone and 200 lbs. of muriate of potash as a fertilizer rotation gave this year an average yield of 8,104 lbs. of hay per acre in 2 crops. A portion of the field reseeded last year yielded 8,546.5 lbs., as compared with 6,243 lbs. for the portion not reseeded. On one plat reseeding

almost doubled the yield of hay. The average yield of the field since 1893 is 6,597 lbs. of hay per acre; and the average yield when top-dressed with manure 6,827 lbs.; with wood ashes, 6,427 lbs.; and with bone and potash, 6,562 lbs.

Winter and spring applications of barnyard manure were again compared, with the advantage slightly in favor of the winter application. This result is considered due to the ground remaining unfrozen under the snow, and that there was practically no wash over the surface.

Annual report of the Dumraon Experimental Farm for the year 1902-3, D. N. MOOKERJI (*Dept. Land Records and Agr., Bengal, Ann. Rpt. Dumraon Expt. Farm 1902-3, pp. 9*).—A brief historical note on the farm is given, and analyses of the surface and subsoil of the farm and a statement showing the distribution of rainfall for the year are presented. The results of different experiments are briefly reported.

Fertilizer experiments were conducted to ascertain the relative merits of different fertilizers on paddy, wheat, and sugar cane. The best yield of paddy was obtained from the use of 19 maunds[a] of cow manure and 4 maunds of castor cake per acre. The returns from this plat were closely followed by the yield on a plat receiving ashes of dung at the rate of 38 maunds per acre. Sun hemp used as a green manure gave almost as good results as the use of 38 maunds of cow manure alone. The results of the experiments with wheat were largely in favor of the use of 125 maunds of cow manure. Indigo, sun hemp, kurthi, and mung sown the second week of July and plowed under for green manure the second week of August, did not give very good results, indigo being the only one netting a small profit. Sugar cane was damaged by white ants and no results are reported.

Umballa potatoes were planted to compare the results from whole tubers and cuttings as seed. The whole tubers yielded at the rate of 9,200 lbs. per acre, and the cuttings at the rate of 8,200 lbs.

Twenty-nine varieties of paddy were grown for comparison and the largest yield of both grain and straw, being 2,700 and 10,440 lbs., respectively, was obtained from Sukarel, a Bombay variety.

Twenty-six varieties of hard and soft wheat, including Indian and Australian varieties, were under test and the results are shown in a table. A soft white wheat from the United Provinces of Agra and Oudh led in yield of both grain and straw, being 3,096 and 4,320 lbs., respectively.

Of 8 varieties of sugar cane Khari and Hullu Cabu led in yield. Thin canes gave the best results.

Six varieties of oats were sown the last week of October, and of these the local variety and Canadian Welcome were harvested the second week of March, and New Zealand, White Canadian, and Algerian the second week of April. The local variety was the most prolific, leading in yield with 4,800 lbs. of grain and 6,400 lbs. of straw per acre. Canadian Welcome gave a yield of 2,400 lbs. of grain and 4,800 lbs. of straw. The other varieties gave unprofitable yields of grain.

Three varieties of American sweet potatoes were compared with the local variety, and the yields obtained per acre were as follows: New Jersey 8,000, Mansimond 5,700, Virginia 4,800, and the local variety 6,400 lbs.

A number of forage and other crops were tested and brief notes are given on this work.

Annual report of the Burdwan Experimental Farm, 1902-3, D. N. MOOKERJI (*Dept. Land Records and Agr., Bengal, Ann. Rpt. Burdwan Expt. Farm 1902-3, pp. 10*).—A brief description of the farm and a record of the rainfall during the year are given, and the results of experiments are reported. Similar experiments have been previously noted (E. S. R., 15, p. 463).

[a] Legal maund of India about 82 lbs.

The results with different manures were again in favor of bone meal and saltpeter. Where the different fertilizers were applied in quantities furnishing 50 lbs. of nitrogen per acre, the net profit was not very high. Green manuring with jute and sun hemp (*Crotalaria juncea*) produced larger yields than the application of 50 maunds of cow manure. Paddy sown at the rate of 30 lbs. per acre yielded 3,030 lbs. of grain and 6,254 lbs. of straw; while a sowing at the rate of 60 lbs. per acre yielded 2,983 lbs. of grain and 6,129 lbs. of straw. Among 6 varieties of paddy from different sources Sukhavel and Kamode, both Bombay varieties, gave the most promising results.

The results with potatoes show that castor cake applied alone gave the largest yield. Rape cake and saltpeter gave a larger yield than rape cake alone. From the data obtained saltpeter is regarded as an unsuitable fertilizer for potatoes. The only profitable applications were farm-pitted cow manure, castor cake, and castor cake and saltpeter. Green manuring either with or without other fertilizers was also profitable. Whole tubers gave a better yield than cuttings. Five varieties varied in yield from 8,820 lbs. to 21,156 lbs. per acre. Patna stood first in yield and profit.

The Woburn field experiments, 1902, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 328–347, figs. 4*).—These experiments are in continuation of previously reported work (E. S. R., 15, p. 765).

The results with growing wheat and barley continuously under different annual fertilizer treatment are tabulated and discussed. The fertilizers used in this connection were ammonia salts, or equal quantities of sulphate of ammonia and muriate of ammonia containing 50 lbs. of ammonia; nitrate of soda furnishing as much nitrogen as 50 lbs. of ammonia; and mixed minerals consisting of 3.5 cwt. of superphosphate of lime, 200 lbs. of sulphate of potash, 100 lbs. of sulphate of soda, and 100 lbs. of sulphate of magnesia per acre. Rape cake was applied in quantities furnishing 50 or 100 lbs. of ammonia, and barnyard manure in quantities furnishing 200 lbs. of ammonia per acre.

In the tests with wheat this year nitrate of soda applied alone gave 25 bu. per acre, or 1.5 bu. more than the average, and where mixed minerals were given with it, 35.8 bu. per acre were obtained; but doubling the quantity of the nitrate in this combination gave a smaller yield. Ammonia salts gave much less satisfactory results than nitrate of soda, but the plat which had received lime at the rate of 2 tons per acre in 1897, yielded 8 bu. more than the plat which this season had received ammonia salts alone. The nitrate of soda plat also gave better results than ammonia salts and minerals, and ammonia salts doubled in quantity. Barnyard manure gave the best yield, 39.4 bu. per acre, being followed by the larger application of rape cake with 37.5 bu.

Hallett Pedigree barley was grown this season in these fertilizer tests. Ammonia salts without lime gave low yields, less than 1 bu. per acre being obtained when used alone. With the addition of lime applied in 1897, the yield was 29.6 bu.; while with mineral manures they gave a yield of 51.4 bu. per acre. The highest returns, 53.4 bu. per acre, were obtained from the plat receiving minerals annually and a double quantity of ammonia salts every other year, including 1902. The barnyard manure plat yielded 49.8 bu. and the heavily fertilized rape-cake plat, 48.3 bu. per acre.

In rotation experiments a fourth successive barley crop grown without manure yielded at the rate of from 16 to 32.1 bu. per acre. The rotation test in progress on Lansome Field resulted in the best yield of barley on the plats receiving decorticated cotton cake as a top dressing. The use of maize meal remained without effect. Mustard, rape, and tares were grown on this same field for green manuring. One-half of each plat was fertilized at the rate of 3 cwt. of superphosphate and 2 cwt. of kainit per acre.

Mustard made a much better growth than the other crops, and the results for 6 years show that the mustard has been a more effective green manure than the tares.

This season the mustard plants on the fertilized portions of the plats were practically all healthy, while those on the unfertilized portions were greatly affected by finger-and-toe disease. It is not known whether or not this result was due to the fertilizers applied. The first cutting of mustard in 1902 yielded 6,888 lbs. of green crop per acre, and the corresponding cutting of tares 8,463 lbs. These yields furnished 27.5 and 60.1 lbs. of nitrogen per acre, respectively.

Tests of 2 grass mixtures consisting of grasses and clovers together with certain deep-rooting plants, such as chicory, burnet, and kidney vetch, are described. The rotation consists of pasture 4 or 5 years and roots, cereals, and roots each 1 year, after which the land is again seeded to grass in a cereal crop. This year was a first season for the grass crop, and the yields were over 3 tons 7 cwt. for one mixture, and over 2 tons 18 cwt. for the other.

Experiments on the prevention of potato disease on Lansome Field in 1902 showed that where potatoes were sprayed July 24 with a mixture consisting of 20 lbs. of sulphate of copper, 20 lbs. of lime, and 100 gal. of water, there were never more than 2 cwt. of diseased tubers per acre as compared with 17 cwt. for the unsprayed crop. Spraying appeared to prolong the period of growth and to increase the starch assimilation. In connection with this experiment, manure from bullocks fed linseed cake and decorticated cotton cake was more effective than manure from bullocks fed beans, oats, and wheat.

Fresh lime at the rate of 2 tons per acre seemed more effective in reducing finger-and-toe disease in turnips than either gas lime, finely ground lime, or lime treated with carbolic acid applied at the same rate. Basic slag at the rate of 10 cwt. per acre was not as effective as the different forms of lime.

Cooperative field experiments, 1903 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 3, pp. 469–510*).—Similar experiments were made in 1902 (E. S. R., 15, p. 664). In a variety test Archer Chevalier barley, as in previous years, gave a better average yield than either Goldthorpe or Standwell, but in quality it was inferior to these varieties. Goldthorpe and Standwell mature better than Archer Chevalier in unfavorable ripening weather, but are subject to loss through the dropping off of the heads.

The results of fertilizer experiments with Archer Chevalier showed but a nominal profit, and indicated that in general each farm needs its individual fertilizer treatment. For soils in a low state of fertility the application used, consisting of 1 cwt. of sulphate of ammonia, 3 cwt. of superphosphate, and 2 cwt. of kainit, was productive of good results.

In a second series of tests Archer Chevalier gave a better yield and a higher return than Garton Brewers' Favorite, Garton Invincible, Hallett Pedigree, and Scotch Chevalier. In previous years Hallett Pedigree and Scotch Chevalier were much superior in quality in certain counties. The Garton varieties stood low in money value per acre, but in quality and manner of ripening they ranked above the Chevalier varieties.

A fertilizer test was made on the same farms with 1 cwt. of sulphate of ammonia and 3 cwt. each of superphosphate and kainit per acre, applied in different combinations. Sulphate of ammonia given alone invariably retarded the ripening and showed tendency of producing a late second growth, especially during a wet season. Superphosphate and sulphate of ammonia given together produced a very profitable average increase. The addition of kainit to the mixture had but little effect. The use of superphosphate and kainit had a very marked effect upon the quality of the grain.

Fertilizer experiments on meadows are reported and, based on the results obtained, a general application of 1 cwt. of nitrate of soda, 2 cwt. of superphosphate, and 2 cwt. of kainit per acre for meadow lands is recommended.

The most profitable application for potatoes consisted of 15 tons of barnyard manure, 1 cwt. of sulphate of ammonia, 4 cwt. of superphosphate, and 1 cwt. of muriate of potash. Without the muriate of potash the profit was reduced about £1 per acre, and the omission of superphosphate caused a further reduction of 34 shillings. In a variety test, Up-to-Date and Beauty of Bute led in yield and produced 5 tons per acre more than Reliance, which ranked last among the 10 varieties grown.

Fodder beets, treated the same as the year before, produced good yields with the use of 15 tons of barnyard manure per acre, but the addition of a complete application of commercial fertilizers to the manure again proved profitable. Four cwt. of salt substituted for 2 cwt. of kainit in this application increased the yield by 24 cwt.

Kainit used alone as a fertilizer for oats has given poor results for 3 successive years. The best result was obtained from the use of 1 cwt. of sulphate of ammonia, 3 cwt. of superphosphate, and 3 cwt. of kainit. The variety test resulted in favor of Goldfinder, Canadian Banner, and Waverley, the 3 varieties being practically equal in their yields.

A complete application of commercial fertilizers for turnips proved better than an incomplete mixture. The results with barnyard manure were similar to those of the previous year.

Report of investigations at the Highmore Station for 1903, W. A. WHEELER (*South Dakota Sta. Bul. 84, pp. 3-8*).—An account of the growth at the station of a number of varieties of grasses, alfalfa, millets, sorghums, corn, rape, and kale. Of 3 varieties of alfalfa the heaviest yield, 3,642 lbs. of hay per acre, was afforded by Samarkand sown in 1900. Siberian millet gave the best yield of 5 varieties tested, namely, 5,410 lbs. per acre. Of the sorghums, Amber Cane and Wisconsin Early Amber yielded over 5 tons each of cured cane per acre. Branching Doura yielded 5,370 lbs.; Jerusalem corn, 2,197 lbs.; Earliest Kafir corn, 4,430 lbs.; milo maize, 5,650 lbs.; and teosinte, 4,340 lbs. per acre.

Early Huron Dent corn yielded at the rate of 18½ bu. per acre; Yellow Dent corn, 21 bu. per acre; Squaw corn, 23½ bu. per acre; Queen of the North, King of the Earliest, and Reid Yellow Dent ripened from one-fourth to one-third of a crop; Iowa Gold Mine, Early Giant White, Wisconsin White Dent, and Riley Favorite corn did not ripen. Superior fodder corn yielded at the rate of about 23⅓ tons of green fodder, or 7⅜ tons of cured fodder per acre. Rape yielded from 3¼ to 4⅝ ton, per acre, and kale at the rate of 6½ tons of green fodder per acre.

References to recent work on plant breeding, C. FRUWIRTH (*Jour. Landw., 52 (1904), No. 3, pp. 269-290*).—References are given to 31 recent articles on plant breeding in connection with different crops. Each reference is accompanied by a brief abstract of the particular article. A previous list of similar references is noted in E. S. R., 15, p. 770.

Reports on the third and fourth years' breeding experiments with root crops at Danish plant experiment stations, 1902-3, L. HELWEG (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 1-20, 324-364*).—The reports contain the usual accounts of the plant-breeding experiments with Elvetham and Eckendorfer mangolds, and with Yellow Tankard, Funen Bortfelder, Bulloch, and New Bronze turnips during the years 1902 and 1903. A paper on Breeding Centers for Fodder Beets, by the author, and the discussion of the same is also given.

The yields of roots and of dry matter per töndeland were determined in the crops produced from the different varieties, and these were scored for uniformity of shape in the roots grown therefrom. The seed produced from the various strains was separated into three classes, according to its quality. The improvement in the quality of the seed of root crops placed on the Danish market is illustrated by the fact that in the spring of 1900, at the beginning of these experiments, only 35,770 lbs. of seed of first-class strains were on the market, against about 350,000 lbs. in the spring of 1904.—F. W. WOLL.

Summary of press bulletins, J. FIELDS (*Oklahoma Sta. Rpt. 1904, pp. 24-40*).—Results obtained at the station from year to year in different lines of work are briefly noted and summarized. The average results for 4 years show that wheat sown about September 15 and October 15 yielded 31.82 and 31.06 bu. per acre, respectively, while wheat sown about November 15 averaged for 3 years only 20.49 bu. per acre. The average results for 4 years on land plowed at different dates are in favor of early plowing, the yields of wheat being 30, 27.7, and 25.65 bu. per acre from July, August, and September plowing, respectively.

On a plat of 1 acre wheat has been grown continuously since 1893. One-half of the plat received 15 tons of barnyard manure per acre in the fall of 1898 and another application at the rate of 11 tons per acre in the fall of 1899. Since then no manure or fertilizer has been applied. The yield for the year 1902-3 was 27.6 bu. for the manured portion and 20.3 bu. for the unmanured portion of the plat, and the average per acre for 5 years, 30.02 and 18.74 bu., respectively.

Since 1892 over 250 varieties of wheat have been tested at the station, and out of this list 25 were grown during the past season. Red Russian, Missouri Blue Stem, Pickaway, Early Red Clawson, German Emperor, New Red Wonder, Big English, Sibley New Golden, Crimean, Paris, and Fultzo-Mediterranean yielded from 36 to 39.5 bu. per acre; Fulcaster, Early Ripe, Turkey, Oregon Red, and Gypsy Amber, from 33 to 36 bu. per acre, and Fultz, Eversaw, and Weissenburg, from 30 to 33 bu. per acre.

Experiments in pasturing wheat, begun in the fall of 1902, have so far shown that light winter pasturing reduces the yield but little, while late spring pasturing causes a marked reduction in the yield of both grain and straw. A plat not pastured yielded 23.2 bu. of grain and 1.49 tons of straw per acre, while a plat pastured lightly during the winter and late in the spring yielded only 10.7 bu. of grain and 0.83 ton of straw per acre.

The average yields of Kafir corn for 4 years amounted to 4,422 lbs. of stover and 1,506 lbs. of grain, and of Indian corn 1,951 lbs. of stover and 622 lbs. of grain per acre.

Notes are given on seeding wheat, growing oats, selecting seed corn as well as Kafir corn and cotton seed, and the growing of rape and Bermuda grass.

Notes on agriculture in the United States, F. BRETTREICH (*Vrtljschr. Bayer. Landw. Rat., 9 (1904), No. 2, app., pp. 125*).—This contains statistical matter compiled from various sources, and the author's observations on the different lines of agriculture in the United States.

Grazing problems in the Western States, E. V. WILCOX (*Out West, 19 (1903), No. 4, pp. 444-449*).—Attention is called to the intimate relationship between the development of the range stock business and the system of management and the condition of the range. Great deterioration in range conditions has been noted in a number of localities, and a system of leasing the public domain is recommended as a means of preventing the wanton destruction of the grazing lands.

Alfalfa in New York, J. L. STONE (*New York Cornell Sta. Bul. 221, pp. 14, figs. 2*).—This bulletin discusses the damage to alfalfa fields in New York resulting from the severe winter of 1903-4, and presents suggestions regarding the culture of the crop.

Alfalfa or lucern, J. H. GRISDALE, F. T. SHUTT, and J. FLETCHER (*Canada Cent. Expt. Farm Bul. 46, pp. 19, pls. 2, figs. 4*).—This bulletin discusses the culture and uses of alfalfa, points out its value as a fodder and a fertilizer, and treats the subject from a botanical and historical standpoint. The results obtained at the Canada Experimental Farms with this crop are reviewed, and its composition as a fodder and fertilizer is compared with that of other forage crops.

Manurial experiments with barley (*Jour. Bd. Agr. [London], 11 (1904), No. 4, pp. 211-214*).—These experiments were made at the Midland Dairy Institute in 1903.

Nitrate of soda was applied at the rate of either 1 or 2 cwts. per acre, and superphosphate and kainit at the rate of either 2 or 4 cwts. An application of 1 cwt. of nitrate of soda and 2 cwt. each of superphosphate and kainit per acre served as a standard for comparison. Doubling the quantity of nitrogen increased the average yield by 3 cwt. 47.5 lbs. per acre, and doubling the quantity of kainit gave an increase of only 85.5 lbs. The larger dressings of superphosphates diminished the yield about 25.5 lbs. per acre. The largest crops were obtained on the plats receiving 2 cwt. of nitrate of soda per acre. No difference was observed in the quality of the barley from the various plats.

A fertilizer experiment with barley carried out by the Yorkshire College indicated that a complete application of commercial fertilizers gives the best results, the best yield, the lowest percentage of nitrogen, the highest proportion of potash, the highest proportion of extract, and the highest diastatic capacity being all in its favor.

The influence of early and late spring plowing upon corn production, M. QUIROGA (*Ohio State Univ. Bul., 8. ser., No. 28 (Agr. Ser. No. 1), pp. 23, charts 3*).—Land was plowed for corn on April 7 and 10 and on June 3. The corn was planted June 4.

The effect of early and late plowing on soil moisture, available nitrogen, and soil temperature was studied. The early-plowed land yielded on an average 6.6 bu. more per acre, showed a greater moisture-holding capacity, especially in the surface foot, and contained much more available nitrogen and a greater amount of water than the late-plowed land. The yield showed a close relation to the amount of moisture and of available nitrogen in the soil during the season. On this particular soil a moisture content below 12 per cent caused the leaves of many plants to curl early in the day, turned the plant yellow, and interfered more or less with its growth.

Nitrification took place with a gradually decreasing intensity at 1, 2, and 3 ft. in depth. The surface foot of the early-plowed land contained twice the seasonal average amount of available nitrogen found on the late-plowed land. Furthermore, the available nitrogen in the surface foot of the early-plowed field was 4 times the quantity in either the second or third foot of the early or late plowed plats.

The late-plowed soil showed the higher mean soil temperature during the entire season and the low mean soil temperature of the early-plowed land was accompanied throughout the season by a greater amount of moisture and available nitrogen. The author states that a high temperature is not always followed by a high rate of nitrification, and he believes, therefore, that the process of nitrification is dependent upon the rate relation between the water content and the temperature of the soil, provided other factors are favorable.

Corn culture at Ivoloina, G. DUCHÊNE (*Agr. Prat. Pays Chauds, 3 (1904), No. 17, pp. 612–616*).—Corn was planted at the experiment station at Ivoloina, Madagascar, between rows of castilloa. The crop planted March 21 matured in 110 days and yielded at the rate of 3,276 kg. of shelled corn per hectare. The castilloa plants grew vigorously and developed symmetrically so long as they were protected by the corn, but when this was removed their development on the side toward the prevailing winds was materially reduced.

The commercial cotton crops of 1900–1901, 1901–2, and 1902–3, J. L. WATKINS (*U. S. Dept. Agr., Bureau of Statistics Bul. 28, pp. 83*).—Statistics with reference to the commercial cotton crops of these years are given, and the commercial crops of 1900–1901 and 1901–2 in each of the cotton-growing States are compared. The consumption of cotton in the United States and the world and the total value of cotton crops in this country are discussed. The shipments made in the different States in 1902–3 are recorded for each railroad station. The cost of picking cotton in the different years is given, and the exports and imports of cotton for the United States during the period are shown in tables. The cotton industry of Brazil is briefly described.

Quantity of cotton ginned in the United States (*U. S. Dept. Com. and Labor, Bureau of the Census Bul. 10, pp. 56, maps 14*).—This bulletin is a report of the cotton crop grown in 1903, accompanied by comparative statistics of the crops for the years 1899 to 1902, inclusive. The statistics presented cover the quantity of cotton ginned from the growth of each year as distinguished from the quantity marketed from September 1 to August 31. In addition the bulletin gives the quantity of cotton reclaimed by thrashing cotton bolls, the vitality of which was destroyed; an estimate of the quantity destroyed by the boll weevil and of its influence on the cotton production of the infested district of Texas; and the distribution by States of the quantity of linter cotton saved by the cotton-seed oil mills by reginning the seed of the crop of 1903.

Cowpeas and soy beans, D. O. NOURSE (*Virginia Sta. Bul. 149, pp. 93–99*).—Brief notes are given on the growth at the station of 20 varieties of soy beans and 10 varieties of cowpeas. The varieties were planted May 18 and 19, and a description is given of their condition on September 11 and 12. Promising results were obtained from varieties introduced by this Department and designated as Department of Agriculture Nos. 8422, 8423, 8424, 8497, 9409, 9415, and 9416, the yields of green product ranging from 11,200 to 18,200 lbs. per acre. Among the cowpeas, Southern, Wonderful, Iron, and Clay, yielding 19,950, 16,400, 15,050, and 14,000 lbs. of green substance per acre, respectively, were the most productive varieties.

Flax experiments, 1903 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 4, pp. 616–638*).—With one exception in the variety tests, these experiments were carried on along the same lines as those of 1902, which have already been described (E. S. R., 15, p. 667).

In cooperative fertilizer experiments the flax yellowed to some extent on all plats excepting on those which had received potassic fertilizers. The plats fertilized with muriate of potash and kainit had the best appearance. The general results with 6 cwt. of kainit per acre show an increase in the yield of straw and of scutched flax. Muriate of potash at the rate of 1.25 cwt. per acre apparently increased the yield of straw and flax, produced a higher percentage of fiber of a slightly better quality, and gave a profit of 17s. 1d. per acre as compared with the unmanured plats.

Plats receiving a mixture of kainit and superphosphate at the rate of 3 cwt. each per acre gave an increase of retted straw and of scutched flax and a decrease in the proportion of scutched flax to straw as compared with the check plat, but the increase in the yield did not defray the cost of the fertilizers. With the addition of 0.5 cwt. of sulphate of ammonia, this mixture increased the yields of straw and flax and the proportion of flax to straw, improved the quality of the flax, and produced a gain in financial results. Five cwt. of rape meal per acre produced good effects, but was unprofitable. Basic slag at the same rate was also applied at a loss. From the results obtained for 3 years it is concluded that the use of a potassic fertilizer, such as muriate of potash or kainit, may be expected to give profitable returns, and that of the 2 fertilizers the muriate is preferable.

In the variety tests of this year English-saved seed was substituted for Riga Pernau Crown seed. Two strains of Dutch seed, Belfast Brand and Riga Child, gave the best results, the Belfast Brand giving slightly better returns than the Riga Child.

Scutching trials with the Irish and the Belgian Courtrai system are again reported, and it is believed "that with practice on a modified Belgian mill Irish workmen would show better results from the use of such a mill than are obtained from an Irish mill." The results of scutching Belgian retted straw by a Belgian mill and by Irish mills gave about the same results as in the previous year, but the difference between the net returns from the straw scutched on the Belgian mill at Courtrai, as compared with those from the Irish mills, was not so great.

Rippled straw yielded only slightly less flax of a slightly inferior quality than nonrippled straw, but the yield of seed was so small that it only just compensated for the decrease in yield and quality of flax and for the extra labor.

Continental methods of retting and scutching were tried on the Continent with Irish flax, and the system of treatment practiced in Lokeren, Flanders, resulted in the highest yield of scutched flax. The quality was better than that of flax scutched at Courtrai after retting in the Lys. Flax steeped once in the Lys at Courtrai gave better results than flax steeped twice. A report by a committee of inspection on the culture and handling of flax in Belgium and Holland is presented.

Perennial and Italian rye grass, D. FINLAYSON and J. S. REMINGTON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 6, pp. 8, pl. 1*).—Notes are given on these grasses and the purity and germination of the samples of seed tested at the Central Seed Testing Laboratory are recorded. A number of impurities common in the seed of rye grasses are illustrated. The average purity of 56 samples of Italian rye grass seed was 93.4 per cent, the average germination, 88.5 per cent; and the average purity of 59 samples of perennial rye grass, 96.5 per cent, and the average germination, 98 per cent.

Plant food removed in the pruning of hop plants, HORECKY (*Deut. Landw. Presse, 31 (1904), No. 57, pp. 500, 501*).—Hop plants were pruned April 20, and analyses were made of roots taken up at this time, and of the new shoots removed in pruning. The method of analyses is described and the results obtained, as given below, are shown in tables:

Analyses of the roots and young shoots of Saaz, Auscha, and native hop plants.

	Roots.			Shoots.		
	Saaz.	Auscha.	Native.	Saaz.	Auscha.	Native.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Dry matter	38.480	29.550	30.560	17.760	19.510	16.460
Potash	.996	.978	.628	.973	.919	.803
Phosphoric acid	.329	.351	.351	.396	.471	.259
Calcium	.675	.384	.443	.134	.198	.275
Magnesia	.219	.174	.189	.063	.134	.113
Nitrogen	7.666	7.641	6.159	6.421	6.385	6.358

Report on experiments on the comparative merits of varieties of oats in 1900, R. P. WRIGHT, A. N. M'ALPINE, and J. W. PATERSON (*West of Scotland Agr. Col. Rpt. 1900, pp. 167–246, charts 6*).—The results of this work for 1899 have been previously reported (E. S. R., 13, p. 131). This season Banner, Waverly, Tartar King, and Newmarket were the most productive, yielding from 2,101 to 2,141 lbs. of grain per acre. Sandy and Tam Finlay led in the yield of straw. On rich soils the varieties most productive in grain were most profitable, while on poor soils the varieties most productive in straw gave the best results. Among the best grain-producing varieties Banner and Waverly are considered the most highly productive and the most generally valuable. In addition to the varieties mentioned Potato, Hamilton, Longhoughton, and Golden Giant were grown, and each one of the varieties is described and its previous record discussed at some length.

Report on the botanical aspects of the oat variety investigations as shown by the experiments made in frames set in the fields, A. N. M'ALPINE (*West of Scotland Agr. Col. Rpt. 1900, pp. 247–284*).—These investigations were made with the varieties of oats entering into the experiments referred to in the above abstract. The tests were carried out on the same fields and under similar conditions, in frames 1 sq. ft. in size, and sown the same as the plats at the rate of 2½ million seeds per acre. The principal data obtained are given in the following tables:

Average results obtained on the different farms.

Farms.	Average germination of seed.	Sheets per 100 plants.	Straws per 100 plants.	Barren shoots.	Straws per 100 seeds.	Straws per acre.	Length of straw.	Weight per straw.	Number of spikelets per ear.
	P. ct.			*P. ct.*		*Millions.*	*In.*	*Drams.*	
Ballinagleck	97	127	121	18	102	2.55	49	1.24	41
Kilmichael	93	118	121	19	90	2.25	47	1.40	43
Girvan Mains	90	176	144	32	106	2.65	49	1.40	62
Grange	85	257	172	42	124	3.10	50	1.25	57
Castlemilk	85	135	133	25	83	2.08	44	.84	30
Hedderwick Hill	80	319	164	39	152	3.80	42	1.10	42
South Alderston	76	162	136	25	93	2.33	49	.96	52
Machriebeg	76	134	121	17	86	2.15	52	1.37	47
Clover Hill	72	208	170	39	85	2.13	56	1.83	71
Barend	56	116	113	13	56	1.40	43	1.10	39
Awhirk	50	195	138	28	72	1.80	42	1.07	46
Boghead	....	164	130	24	100	2.50	40	.73	32

Average results obtained with the different varieties.

Variety.	Average germination of seed.	Shoots per 100 plants.	Straws per 100 plants.	Barren shoots.	Straws per 100 seeds.	Straws per acre.	Length of straw.	Weight per straw.	Number of spikelets per ear.
	P. ct.			*P. ct.*		*Millions.*	*In.*	*Drams.*	
Potato	86	151	112	27	96	2.400	47	1.21	61
Sandy	83	205	140	31	116	2.900	51	1.13	67
Hamilton	82	180	127	30	104	2.600	49	1.17	62
Tartar King	76	141	104	20	80	2.000	45	1.40	40
Tam Finlay	75	243	153	37	115	2.875	49	1.15	50
Waverley	75	146	116	20	83	2.075	47	1.13	29
Longhoughton	73	151	110	28	80	2.000	45	1.16	49
Newmarket	73	162	113	30	83	2.075	45	1.14	24

The observations on the germinating power of the seed show that Potato, Sandy, and Hamilton outranked all other varieties. Tillering power on the different farms was not an indication of high yields. Tam Finlay and Sandy tillered most and produced the largest number of straws and the largest number of barren shoots. The conclusion is drawn from the study of crop density that the best thickness of oats lies between 2 and 2.6 million straws per acre. Sandy, Hamilton, and Potato produced the largest number of spikelets per head.

Report of the results of the analyses of oats (grain and straw) grown in the oat variety experiment, J. W. Paterson (*West of Scotland Agr. Col. Rpt. 1900, pp. 285–288*).—The analyses here reported were made in connection with the experiments described in the foregoing abstract. The samples of both grain and straw were dried at 100° C. The grain of only 4 varieties was analyzed, while the composition of the straw of all varieties was determined.

Composition of the grain.

Variety.	Crude protein.	Oil, etc.	Carbohydrates.	Woody fiber.	Ash.	Moisture in fresh sample.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Potato	11.91	8.26	65.18	11.91	2.74	15.97
Banner	12.42	6.17	65.66	12.56	3.19	16.37
Waverley	11.60	5.93	66.80	12.56	3.11	16.33
Newmarket	12.00	5.95	68.49	10.57	2.99	16.42

The average composition of the straw of the 10 varieties taken from each farm, as in the grain samples, was as follows: Crude protein 2.34, albumen 2.03, amids 0.30, oil 2.03, carbohydrates 42.02, woody fiber 46.85, ash 6.76, and moisture in fresh

sample 10.74. Samples of the straw from two of the farms were analyzed separately in addition, to show that soil and climate had a greater influence on the composition of the straw than on the composition of the grain.

Some investigations of transmission and variability in oats, with special reference to the possibility of isolating types high in fat adapted to the manufacture of shelled oats, A. V. KRARUP (*Copenhagen: Aug. Bang, 1903, pp. 70*).—The variety of oats with which the author conducted his extensive investigations was Beseler. This variety was chosen on account of its relatively high content of fat and nitrogen, clean kernels, and thin hulls, qualities desirable for the manufacture of shelled oats. The crops grown during 4 successive years (1899–1903) were studied to determine correlation in characters and the fixedness of the characters in the strains grown.

The oats used in the first year's work were found to contain different types of greatly differing characters. Five isolated types were grown for 4 years, 2 of which were high in fat, 2 medium high (1 with high kernel weight), and 1 low in fat. Kernels taken from the outer and inner portions of the panicle were compared. A correlation was found in the data for fat content and kernel weight, increasing kernel weight being in general associated with decreasing fat content, and vice versa. While there is no absolute uniformity in this relation, it is sufficiently regular to furnish a reliable method for determining the relative fat content of different crops of the same variety from the weights of outer grains.

An increase in fat content and a decrease in kernel weight, as a rule, accompanied an increase in the number of panicles, and a high kernel weight appeared to be associated with a low nitrogen content and a high percentage of hulls. The quality of the crop does not appear to be influenced by the different properties of plants grown from outer and inner kernels of the same parent plant. In general, the selection of varying individuals within the same strain or family did not influence to any appreciable extent the qualitative properties of the offspring, showing that the types isolated from the original seed oats in 1899 were quite fixed.

A bibliography of 17 references is given at the close of the report.—F. W. WOLL.

Transmission of characters in potatoes, C. VON SEELHORST and W. FRECKMANN (*Jour. Landw., 52 (1904), No. 1–2, pp. 151–162, dgms. 5*).—Experiments have been in progress for several years to demonstrate the possibility of increasing the yielding capacity of varieties by selecting the seed tubers from large prolific plants. For this purpose large and small tubers of 3 varieties selected from both large and small plants were used for seed, and the results obtained are here tabulated and presented graphically. The mother plants were classified with reference to size according to their weight. The relation of the size of the mother plants to the specific gravity of the progeny, and of the specific gravity of the one to the specific gravity of the other, is also shown.

The authors conclude that the experiments indicate that seed selected from strong and prolific plants increases productiveness. The form of the mother plants also seems to be a character capable of transmission, and it is recommended that in selection the form also be taken into consideration.

Potato production (*Quart. Rpt. Kansas State Bd. Agr., 23 (1904), No. 91, pp. 205, figs. 9*).—This publication is a compilation of articles on the culture and uses of the potato and the sweet potato. The experience of Kansas potato growers, with estimates of the cost of production per acre, are given by counties. The total production of potatoes in different counties for the years 1899 to 1903, inclusive, is shown in a table. The culture of the sweet potato in Kansas is also discussed.

New white potato, T. HAYNES (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 286, pp. 78, 79*).—A description is given of this plant, which is *Solanum commersonii*, and its probable value is pointed out. An instance is cited where, in

1903, 98 per cent of the tubercles of this new potato were in good condition, while of the Early Rose potato grown under similar conditions, but having been affected by plant diseases, only 15 per cent were good. The yield of this new potato was also much greater than that of the Early Rose and the American Marvel.

Sorghum as a sirup plant, J. S. NEWMAN ET AL. (*South Carolina Sta. Bul. 88, pp. 31*).—The study of sorghum as a sugar and sirup producing plant is briefly noted, and the results obtained at the station from 1900 to 1903, including chemical data, are reported.

In 1900, 13 pedigreed varieties were grown; in 1901, 12; in 1902, 6, and in 1903, 7. Prior to 1903 the results were based on the analysis of the cane and the practical working of the same for the production of sirup, but during the last season only chemical analyses were made. The yield of sirup per acre in 1900 ranged from 30.3 to 155.6 gal. per acre, the corresponding yields of stripped cane being 15,756 and 6,201 lbs. per acre, respectively. These yields of cane also represent the extremes. In 1901 and 1902 the sirup production ranged from 53.6 to 94.7 gal. and from 24.9 to 72.8 gal., respectively. The results obtained in 1903 are given in the table below:

Results with varieties of sorghum in 1903.

Name of variety.	Stripped cane per plat.	Juice per plat.	Stripped cane per acre.	Juice per acre.	Juice in cane.	Cane sugar in juice.	Sugar per acre.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*P. ct.*	*P. ct.*	*Pounds.*
Amber, western grown	250.0	78.8	6,250.0	1,970.0	31.52	13.65	268.90
Amber, home grown	417.5	118.9	10,437.5	2,972.5	28.47	16.12	479.36
Early Orange	425.0	154.4	10,625.0	3,860.0	36.32	15.49	566.56
Kansas Orange	400.0	112.5	10,000.0	2,812.5	28.12	15.77	443.52
Folger	330.0	89.5	8,250.0	2,237.5	27.12	13.02	291.32
Coleman	395.0	117.8	9,875.0	2,945.0	29.82	13.43	395.51
Collier	385.0	109.5	9,625.0	2,737.5	28.44	15.97	437.17

In one test plants were thinned to 4, 3, 2, and 1 stalks per foot of row and the yields of sugar obtained per acre were 78.14, 87.36, 115.45, and 116.55 lbs., respectively. The best yields of cane and sugar per acre were obtained from a planting made April 21, as compared with plantings made May 6 and 22 and June 10; but the percentage of sugar was highest in the cane planted latest. The results of a fertilizer test lead the authors to infer that 250 lbs. of cotton-seed meal per acre would be as effective in producing cane and sirup as 200 lbs. of cotton-seed meal, 300 lbs. of acid phosphate, and 80 lbs. of kainit per acre. These experiments have been in progress only one season.

The total solids, sucrose, and purity coefficient were determined in the samples for the different experiments and are recorded. In the variety test for 1903 the average of all the samples gave 20.04 per cent of total solids, 14.78 per cent of sucrose, and 73.8 per cent of purity. The average results of 6 fiber determinations gave 10.15 per cent of fiber and 89.85 per cent of juice. Data obtained in connection with work on sorghum in 1898, 1899, 1900, and 1901 are also recorded in tables and noted.

Experiments with sugar beets in 1903, C. D. SMITH (*Michigan Sta. Bul. 215, pp. 19*).—In studying the variation of sugar content in beets the author found that in one instance the difference in sugar content of adjacent beets grown from the same seed and under identical conditions amounted to over 3 per cent, while a difference of over 2 per cent was frequently shown.

Two methods of sampling were compared. In the first, 1 beet was selected every 5 paces in each row of the plat, making a composite sample of 45 beets, and in the second, 10 beets were taken from the low and high areas of the plat for the purpose of representing each soil type. The first sample showed 14 per cent of sugar with a purity of 83.9, and the second, 13.2 per cent of sugar with a purity of 80. The loss

in weight of beets sent to the station was sufficient to make a difference of from 3 to $4\frac{1}{2}$ per cent in the sugar content. A beet stripped of its leaves but not topped, sent by mail well wrapped, and in transit 72 hours lost 13.79 per cent in weight, while a topped sample sent under the same conditions lost 12.90 per cent.

An experiment in lifting beets, to prevent a second growth, by breaking the tap roots and tearing the lateral roots, seemed in the particular instance to have prevented a change in the composition of the beets.

The weight of the roots, crowns, and leaves in 2 lots of clean, untopped beets was determined and the results showed that the leaves and crowns constituted from 40 to 44 per cent of the weight of the topped beets. The quantities of leaves and crowns in each test were about equal in weight.

A test of 16 varieties was conducted in 3 localities on different types of soil. The variation in sugar content in the same variety grown under different conditions was quite marked, and the results did not show that any one variety was superior on all 3 types of soil.

The studies on the exhaustion of the soil by beets was continued (E. S. R., 15, p. 35). Oats, beets, and corn were grown on plats of light sandy loam soil. One of the plats had produced beets 3 years in succession, while the others had been under different crop rotations. The yield of all these crops on the soil having been in beets for 3 successive years was much smaller than the yields on the 2 plats under rotation, and this is regarded as showing conclusively how continued beet culture would injure a light sandy loam soil. In summing up the results of a series of distance experiments the author states that a row narrower than 22 in. is advisable only on the very richest soils, and that a greater distance up to 28 in. between the rows is more profitable on soils of average fertility.

The fertilizer tests reported show that complete commercial fertilizer applications are profitable. The substances used were nitrate of soda and sulphate of potash given at the rate of 100 and 200 lbs. per acre, and dissolved South Carolina rock, at the rate of 200 and 400 lbs. per acre. The 3 plant-food elements were needed on all plats in the test except on one, which yielded nearly 15 tons per acre without the use of fertilizers. The results of work in previous years, showing that on the college farm reasonable quantities of nitrogen, phosphoric acid, and potash in beet culture may be applied with profit, are summarized.

An experiment was conducted in cooperation with this Department on the prevention of leaf blight by spraying with Bordeaux mixture or by manuring with nitrate of soda or common salt. The results did not warrant definite conclusions, but spraying apparently reduced leaf blight. Nitrate of soda gave a dark color to the plants. Common salt produced vigorous plants, but yellow in color, and did not show any effect on leaf blight.

Phosphate and potash fertilizers for beets, D. Kochenovski (*Zhur. Opuitn. Agron., 5 (1904), No. 3, pp. 326–327*).—The results here reported were obtained in the chemical laboratory of the Smyela Estate, owned by the Counts Bobrinski.

A series of 70 analyses of various beet soils showed that the soil yielding beets of the highest quality contained a smaller amount of nitrogen in relation to potash and phosphoric acid than the soils producing beets of inferior quality. From these results it appears that fertilizing with phosphoric acid and potash would improve the quality of the beets. On further investigation the author found that the beets poorest in quality for manufacturing purposes contained relatively the greatest amount of nitrogen. The contents of phosphoric acid stood in inverse ratio to the total weight of the root, and the consumption of potash was approximately proportional to the yield.

It is concluded that in order to obtain a large yield of good beets the soil must receive a definite amount of phosphoric acid and a large quantity of potash. It is stated that on soils containing less than 0.02 per cent of available phosphoric acid the use of phosphatic fertilizers is advantageous. The objection to the use of different

forms of potash is discussed, and the author proposes the use of a mixture of sugar-house refuse and kainit, in the expectation that under the influence of rain and air this mixture will form gypsum and potassium carbonate.—P. FIREMAN.

Experiments with sweet potatoes at Barbados, R. R. HALL and J. R. BOVELL (*West Indian Bul., 5 (1904), No. 1, pp. 41–52*).—The yield of tubers and vines and the analyses of both with reference to food and fertilizer constituents are tabulated for 28 varieties of sweet potatoes grown in a variety test. The heaviest yielding varieties were White Gilkes 4.97 tons per acre, Moffard 5.01 tons, Hurley 4.59 tons, Minuet 4.42 tons, and Vincelonian 3.49 tons per acre. The food units in pounds per acre are calculated for some of the varieties. Descriptions in brief notes are given of the 28 varieties tested.

Variety tests with vetch (Vicia sativa) and field peas (Pisum arvense) (*Deut. Landw. Presse, 31 (1904), No. 58, pp. 510, 511*).—Twelve varieties of vetch gave an average yield of 21,800 kg. of green forage and 5,028 kg. of hay per hectare; and 6 varieties of field peas, 25,830 kg. of green forage and 4,480 kg. of hay. With the exception of the Swedish variety, the varieties of field peas were about equal in hay production to the lowest ranking varieties of vetch. The field pea varieties varied 28 per cent in the production of air-dry substance, and the vetch varieties 33 per cent.

The yield of wheat at different latitudes, N. PASSERINI (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 1 (1904), No. 1, pp. 126–134*).—The average yield of wheat from different countries is considered, and it is pointed out that the countries of Europe may be divided into 3 groups, according to the average yield. The first or leading group consists of Denmark, Great Britain, Norway, and Sweden; the second of Germany, Holland, France, Belgium, Hungary, Roumania, and Austria, and the third of Italy, Servia, and Spain. The author concludes that the yield of cereals decreases with the latitude.

Wheat production and farm life in Argentina, F. W. BICKNELL (*U. S. Dept. Agr., Bureau of Statistics Bul. 27, pp. 100, pls. 10*).—This bulletin discusses at some length and with considerable detail the wheat industry of Argentina and the farm conditions under which it exists. The different subjects treated are the tenure of agricultural lands, the living conditions on average farms, the present and prospective wheat area of the country, the land and its treatment, and in general the culture and marketing of the crop. Statistics concerning the total area of wheat farms, the average size of farms, the cultivated and uncultivated but arable areas of the country, the price of farm lands, immigration and emigration, the yield of wheat, the cost of production and transportation, and the exportation of wheat and flour are also given.

The area of the wheat crop for 1903–4 is estimated at 10,230,311 acres, or from 15 to 20 per cent of the possible wheat area of the country. Only about one-third of the number of wheat farmers of Argentina till their own lands, the rest being renters, while in the United States only about one-third of the farmers are renters. In 1903 the available public lands amounted to 237,768,303 acres. The net immigration for the same year was 35,359.

The varieties of wheat grown are mainly soft or bread wheats, only a comparatively small quantity of durum wheat being produced. The more important varieties have been introduced from Italy, Russia, Hungary, and France. The cost of producing an acre of wheat is variously estimated at \$4.93, \$7.03, and \$7.40. The average yields per acre for 10 years, ending with 1901, in different sections of the country vary from 10.63 bu. to 38.84 bu. During the years 1892–1901 the total production of the country ranged from 31,593,571 bu. in 1897 to 99,075,349 bu. in 1900, while the average price per bushel for the same period varied from \$0.4793 in 1894 to \$0.8562 in 1897. The exportation of wheat reached its height in 1903, when, it is estimated, 75,000,000 bu. were shipped from the country. In addition, 809,628 bbls. of flour were exported.

Variety tests of wheat, G. C. WATSON and A. K. RISSER (*Pennsylvania Sta. Bul. 67, pp. 8*).—The experiments are described in general and the work of the season is noted. For the crop of 1903 the land was plowed about 8 in. deep August 20, 1902, top-dressed with 8 tons of barnyard manure per acre, harrowed several times, and rolled before seeding. Twenty varieties were sown September 8, at the rate of 8 pk. per acre, and the ground was given an application of 180 lbs. per acre of commercial rock phosphate.

The plats were harvested July 11. The average yield obtained per acre was 32.19 bu. The 13 smooth varieties averaged 32.09 bu., and the 7 bearded varieties, 32.33 bu. The leading varieties were Forty-Fold or Gold Coin, Royal Red Clawson, Dietz Longberry Red, Fulcaster, and Fultz, yielding 35.37, 34.98, 34.86, 34.21, and 34.05 bu. per acre, respectively. American Bronze ranked last, with a yield per acre of 26.90 bu. The bearded varieties weighed 1.67 lbs. more per measured bushel than the smooth sorts.

In addition to the yields for the season, the average yield for the entire period of the experiment is also reported. Of the varieties under test for 14 years, Fulcaster and Reliable have given the best general results. Fulcaster leads in yield of grain and straw, and in the weight per measured bushel. Among the varieties grown for 8 years, Royal Red Clawson has given promising results, and of those grown 3 years, Turkish Amber has been most satisfactory.

The results with early and late seeding have varied in different years, and the conclusion is drawn that the season largely governs the time of sowing.

Cooperative cereal investigations at Highmore, J. S. COLE and E. C. CHILCOTT (*South Dakota Sta. Bul. 84, pp. 9–14*).—Tabulated data, with comments, are given for the yields of a number of varieties of macaroni wheat, barley, oats, and emmer. The rainfall during the early part of the season was very light, and many of the grains were seriously injured.

The yield of macaroni wheat ranged from 9 to over 20 bu. and averaged 14.65 bu. per acre. The season's experiments indicated clearly its great drought-resisting quality. Two varieties of emmer or spelt gave yields of 23 and 20 bu. per acre, respectively. Six varieties of oats were tested. One was a total failure; the other 5 gave an average yield of 31½ bu. per acre. The heaviest yield was made by Swedish Select oat—38.12 bu. per acre. Of 26 varieties of barley tested, 5 were total failures. The other varieties yielded from 10.62 to 27.50 bu. per acre. The latter yield was made by Minnesota No. 6.

A new method of sowing for the protection of winter grains, FALKE (*Deut. Landw. Presse, 31 (1904), No. 64, pp. 553, 554*).—A comparison between grain sown with the press drill and with the ordinary drill is reported and discussed. Grain sown with the press drill gave a better stem, a higher weight of plants and of the dried roots, favored tillering to a greater extent, and showed an increase in the height of plants as compared with the grain sown in the ordinary way. The results were quite marked, and this is considered due to a dry season.

Variety tests with different grains, T. REMY, P. EHRENBERG, and E. SIERIG (*Deut. Landw. Presse, 31 (1904), Nos. 25, pp. 215, 216; 26, pp. 225, 226; 27, p. 239; 28, pp. 245, 246*).—Variety tests with oats, spring wheat, and barley are reported. Among 22 varieties of oats from different sources, Svalöf, Ligowo, Duppau, and Hopetown were the most productive. Duppau is of medium quality, but the other 2 varieties are ranked as excellent. Beseler No. 1 proved a good straw producer, but stood low in the yield of grain. Beseler No. 2, Beseler No. 3, and Strube Schlanstedt stood up well, and are therefore considered suitable for irrigated fields or other conditions which tend to lodge the grain.

Seven varieties of wheat were sown April 9, and by July 23 all except Noë, Heine Bordeaux, and Red Mountain lodged completely. White Mountain led in the yield of grain and Red Schlanstedt in the yield of straw. White Mountain also gave the

best yield under irrigation. It is stated that Red Schlanstedt, Heine Bordeaux, and Noë, which have been derived from winter wheats, are not adapted to late sowing.

The barley was grown on a soil rich in nitrogen, which resulted in a complete lodging and a consequent loss in quality. Good yields were obtained, and Svalöf Chevalier was especially productive. The Imperial Barley stood up well, indicating a capacity to withstand lodging. Imperial Type A gave very promising results. In a series of irrigated plats the varieties all lodged and the results were not considered.

HORTICULTURE.

Report of the Department of Horticulture, F. A. Waugh and G. O. Green (*Massachusetts Sta. Rpt. 1903, pp. 154–172*).—An outline is given of the work of the year, including descriptive notes on 65 varieties of strawberries, and an account of cultural methods for this fruit.

Some data are given on the results of shipping apples in boxes, showing that this practice has proved profitable, and sometimes highly so. In one instance Gravenstein apples were shipped both in barrels and in bushel boxes the same day to the same dealer, the fruit being of like quality in each case. The apples sent in the boxes were wrapped. The barrels sold for $2 each and the boxes brought the same price, although they held only one-third as much fruit. This, however, was an extreme case, and such disproportionate prices have not usually been obtained, although it is believed that fancy fruit will always bring good prices when shipped in boxes. The use of boxes on a large scale is not recommended without considerable preliminary experiment on the part of the shipper.

A good yield of quinces was obtained, which sold at good prices. The quince orchard is located on a springy slope at the base of a hill, the soil being good, rich alluvium.

Horticultural department notes, N. E. Shaw (*Jour. Columbus Hort. Soc., 19 (1904), No. 3, pp. 98–100*).—Notes are given on the growth during the season of a number of vegetables. A liberal use of nitrate of soda on cabbage hastened its growth so that it was possible to market it 10 days in advance of the maturity of cabbage in the neighborhood. A return of $100 was secured from this crop on something over one-half acre during the last week in June.

The season's experience with Sparks Earliana tomato indicated that this variety, on account of its tender skin and scanty leaf formation, is not able to withstand the hot summer sun of the locality. The variety is a rapid grower, however, and does well in the early part of the season. It is thought that profitable returns might be obtained if the plants were started very early in the greenhouse. Of two other varieties grown, Livingston Magnus and Stone, the Stone variety produced the finest specimens of fruit in 1904, although the preceding season the reverse was true.

The importance and value of the horticultural industries of Ohio, V. H. Davis (*Jour. Columbus Hort. Soc., 19 (1904), No. 3, pp. 100–109*).—Statistics are given on the production in the State of vegetables, orchard products, forest products, small fruits, flowers and plants, grapes, nursery products, and nuts. While Ohio does not stand first in the Union in the production of any of these crops, it stands well up toward the top in the production of all. It ranks third in the production of apples and second in the value of its small fruit products.

Fertilization problems. A study of reciprocal crosses, M. B. Cummings (*Maine Sta. Bul. 104, pp. 81–100, pls. 4*).—In addition to a summary of previous work along this line, the author presents detailed results of his studies with reciprocal crosses of red currant and yellow plum tomatoes, and Golden Custard and Summer Crookneck squashes. The difficulty which has been experienced heretofore in securing reciprocal crosses between the red currant tomato (*Lycopersicum pimpinellifolium*)

and the red currant tomato (*L. esculentum*) was found to be due to the peculiar formation of the pistil of the red currant variety.

The pistil of this variety is considerably smaller than that of the yellow plum, and has the further peculiarity of being constricted and placed in a slight depression in the ovary. The pistil is so small and slender at this point that when the blossom is emasculated and the pistil thus deprived of the protection of the surrounding stamens, it was easily affected by changes of temperature and moisture which in most cases proved fatal.

When the ordinary methods of covering the flowers were employed it was found impossible to keep the pistil fresh in the receptive period long enough for the pollen of the yellow variety to do its work. When the whole plant was covered with bell jars, thus securing a better control of temperature and moisture conditions, successful crosses were made. The difficulty, therefore, which has been previously experienced in securing reciprocal crosses with these plants seems to be a mechanical one and due to the delicate structure of the pistil of the red currant variety.

In the case of squashes crosses were easily secured when Golden Custard was fertilized from the pollen of the Crookneck variety, but the pollen of Golden Custard would not act upon the pistils of the Crookneck variety. The author pollinated 284 pistils of the Crookneck squash with the pollen of Golden Custard. About one-third of this number were picked off at various stages for microscopical studies. The remainder were left on the vines as long as they remained intact. In the histological study of the pistils which were picked off it was found that pollen of Golden Custard germinated on pistils of Crookneck and usually penetrated nearly to the germ cell of the ovary. There it stopped growth. Fertilization did not occur. The reason for the failure appeared to be a refusal of the embryo of Crookneck to be impregnated by pollen spores of the Custard variety.

Some of the pistils which had been left on the vines matured fruits, and when these were cut open in some cases many seeds were found. Of the 200 pistils left on the vines, 18 well-formed fruits were obtained, and of these 18 fruits 5 produced fertile seeds. The experiments therefore seemed to indicate that "Golden Custard pollen varies in its degree of potency and shows all possible stages, ranging from perfect fertility to perfect sterility," as was shown "in the decay of Crookneck pistils when pollinated with Golden Custard, in microscopical sections of such pistils, in the partial and complete development of fruit and seed, and in the sterility and fertility of seed." A bibliography of 32 papers on plant breeding is included.

Culture of asparagus in warm countries, O. Labroy (*Jour. Agr. Trop., 4* (*1904*), *No. 39, pp. 259–264*).—This article summarizes the results which have been secured in a number of different tropical countries in the culture of asparagus. The conclusion is reached that asparagus succeeds in all those tropical countries where it is assured of a rest period in its growth, although the plantation is not as durable as in more temperate climates, and the young stalks are less valuable. In order to secure the best results it is necessary that the plants be cultivated in rich, deep soils and heavily manured and cultivated during their vegetative period.

The chayote (*Queensland Agr. Jour., 15* (*1904*), *No. 3, p. 625, pl. 1*).—It is stated that within the past 2 or 3 years this vegetable has become recognized by the general public in Queensland as an excellent table vegetable. It thrives remarkably well and is noted as one of the most prolific bearers among the Cucurbitaceæ. It is grown in large quantities also for feeding dairy cattle, pigs, and horses. Four hundred fruits have been gathered from a single vine in one season. No disease of any kind has been known to attack the plant in Queensland as yet. It is prepared by cutting the fruit in half, boiling it, and serving with pepper, salt, and melted butter.

Facts about ginseng culture for fruit growers, G. C. Butz (*Pennsylvania State Dept. Agr. Rpt. 1903, pp. 800–803*).—This paper is in part a summary from the author's bulletin on this subject (E. S. R., 14, p. 861). A word of caution is added

regarding ginseng seeds. These should never be allowed to dry out, as they lose vitality quickly by drying. They may be tested by throwing in water; those that float are worthless.

Recently considerable Japanese ginseng seed has been imported and sold as American seed because it is cheaper. The Japanese seed produces an inferior variety of ginseng. It can be detected by the fact that it has ridges over its surface which are not possessed by the American seed. Samples of seed which were claimed to be of Manchurian origin were sent to the author for examination, but in every case have been found spurious.

The cultivation of mushrooms, B. M. Duggar (*U. S. Dept. Agr., Farmers' Bul. 204, pp. 24, figs. 10*).—This bulletin is designed to take the place of an earlier number of this series (E. S. R., 9, p. 357). It contains directions for the commercial culture of mushrooms, with an account of the insects and diseases affecting them, and directions for making spawn.

The author advocates the tissue method of spawn culture which is described essentially as follows: Test tubes or large-mouth bottles are filled with fresh stable manure or with a compost and then sterilized. This material is then inoculated by selecting from a bed of vigorous growing mushrooms a variety which has proved unusually prolific. With a sterilized scalpel and forceps, the stem is broken off and the outer skin peeled off. Small bits of the tissue of the mushroom are then taken and used to inoculate the manure in the sterilized bottles.

It has been found that within the course of a week, or sometimes within 2 days, these bits of tissue will send out a small growth of mycelium which spreads to all parts of the tube or bottle within 3 or 4 weeks. This material can then be used as pure culture virgin spawn for inoculating bricks. This method of producing spawn has been found to be commercially practicable, and 3 varieties of mushrooms named, respectively, Alaska (a white sort), Bohemia (a brown sort), and Columbia (an intermediate or cream-gray sort), have been developed which can be reproduced true to type.

Early garden peas, N. E. Hansen (*South Dakota Sta. Bul. 85, pp. 8*).—In cooperation with this Department the author tested 153 varieties of garden peas and the results as regards the yields, period of growth, size and shape of pods, quality of peas, etc., are tabulated for 80 of the earlier sorts. The earliest varieties were Alaska, Extra Early, Thorburn Extra Early Market, First of All, First and Best, Pedigree Extra Early. Some of the prolific late sorts of fine quality were Abundance, Admiral, Stratagem, Everbearing, Bliss Everbearing, and Sutton Satisfaction.

Recent cultural experiments with Pé-tsaï, J. Curé (*Rev. Hort., 76 (1904), No. 16, pp. 387, 388*).—The author recently conducted some experiments with Chinese cabbage, Pé-tsaï, to see if a crop could not be grown without running to seed. Three different seedings were made on the same day. The first was made in a very warm bed with the idea of burning the first sprouts that germinated. They did not come up until after those sown in the cold soil were showing. These plants were pricked out when the cotyledons were well developed. Thus treated it was found necessary to water them frequently.

None of the plants seeded in the hot soil obtained full development. Two plants developed to about $\frac{3}{4}$ of their size, and in no case was the rudiment of a floral stem observed. A second seeding was made in a bed less warm than the first. At the end of 48 hours all the seeds had shown a good state of vegetation. These plants were not pricked out before setting in permanent places. It was from this seeding that the best results were obtained. Some of the fully developed plants obtained a height of 55 to 60 centimeters with a head weight in some cases of 3 to 4 kg. In no instance were seed stalks produced with this lot of plants.

With the third seeding made in cold soil practically all of the plants went to seed and none produced heads. From these experiments it is believed that in order to

produce good Chinese cabbage it will be necessary to give it the same care as curled chicory or turnips in forced culture. Some suggestions are given on the preparation of this vegetable for the table.

Notes on varieties of tomatoes, V. H. DAVIS (*Jour. Columbus Hort. Soc., 19* (*1904*), *No. 3, pp. 114–116*).—Notes are given on a number of varieties of tomatoes tested at the station during the season. Sparks Earliana proved a very satisfactory sort. The fruit is of good size, fairly smooth, and of excellent quality for an early tomato. Objections to the fruit were its rather open growth and its tendency to scald.

A new tomato (*Gard. Chron., 3. ser., 36* (*1904*), *No. 925, p. 198, fig. 1*).—A description is given of a new tomato, "The Reverend Laycock." It is an especially handsome tomato, characterized by great fleshiness, small number of seeds, firm skin, and excellent flavor. It has a shining mahogany color when ripe. It appears to be a heavy bearer of good-sized fruits.

Orchard studies—XVI. The composition of apples, W. B. ALWOOD and R. J. DAVIDSON (*Virginia Sta. Bul. 143, pp. 283–299*).—The authors present the results of analyses of 10 varieties of summer apples, 13 of autumn apples, 19 of winter apples, and 7 of crab apples, with reference to the amount of juice and pomace, and the composition of the juice with reference to solids, sugar, acids, tannin, and specific gravity, and the composition of the pomace with reference to moisture, ash, sugar, acids, and tannin. The determination of moisture, solids, nitrogen, ash, phosphoric acid, potash, and lime is also given for a few of the different classes of apples noted. The purpose of the work is to secure accurate data as to the quality of the different varieties and their relative value for purposes of manufacture of secondary products. It is also hoped that the data may be found valuable in crossbreeding work in the future.

Considering all the results together, the average water content of the whole fruit varied in the experiments from 80 to about 86 per cent of their total weight. With an 80-ton hydraulic press it has been possible to obtain only about 74 per cent of the weight of the fruit as juice. It is considered that in practice 70 per cent is a very high average. The amount of juice recovered in the summer varieties of apples examined averaged 48.91 per cent. Omitting two varieties which were specially poor in juice, the average was 53.20 per cent. The juice obtained from autumn varieties averaged 53.92 per cent of the weight of the fruit; of winter apples, 52.16 per cent, and of crab apples, 57.31 per cent.

The crabs thus show the highest percentage of juice of any of the different groups of apples examined. The average total sugar content of the juice of summer varieties was 9.53, autumn varieties 10.66, winter varieties 11.43, and crab apples 11.71 per cent. The amount of sugar remaining in the pomace varied from 4.16 per cent in the case of summer apples to 4.38 per cent in autumn apples. Pomace of winter apples contained 4.29 per cent of sugar, and of crab apples 4.26 per cent. It is believed that the sugar content in the pomace could be extracted by exhaustion with warm or cold water in some such manner as is followed in beet-sugar diffusion batteries. The weak must, or juice, thus recovered could be used for diluting richer juice intended for vinegar stock. The value of pomace for stock feed when ensiled is also pointed out.

The apple in Oregon, E. R. LAKE (*Oregon Sta. Bul. 81, pp. 32, pls. 8, map 1*).—The author discusses the early history of apple growing in Oregon, including an account of the rise and decline of early planted orchards, and gives directions for planting and caring for orchards in the State at the present time.

Planting the apple orchard, L. B. JUDSON (*Idaho Sta. Bul. 43, pp. 321–351, figs. 15*).—Popular directions are given for planting and growing orchards, from the selection of the site to the harvesting of the fruit.

Picking and handling winter apples, J. S. WOODWARD (*Rural New Yorker, 63* (*1904*), *No. 2855, p. 745*).—Directions are given for modern methods of picking and

handling apples in the orchard. Relative to the storage of apples in cellars, the author states that it has been found that the apples kept much better if stored in bulk in the cellar than if put into barrels, and the larger the bins and more apples that are put together the better they keep. The author has never had apples, even Greenings, scald when stored in bulk in large bins. Apples which are intended for barreling and immediate shipment are barreled as rapidly as picked, instead of being allowed to lie and sweat, as was at one time thought desirable.

Keeping quality of apples, F. H. HALL (*New York State Sta. Bul. 248, popular ed., pp. 11*).—This is a popular edition of New York State Station Bulletin 248, by S. A. Beach and V. A. Clark, on New York apples in storage, previously noted (E. S. R., 16, p. 50).

A horticultural freak (*Orange Judd Farmer, 37 (1904), No. 16, p. 359, fig. 1; Amer. Agr., 74 (1904), No. 16, p. 324, fig. 1*).—This is a discussion of the merits of the seedless apple, an illustration of which is given showing a cross section. It is pointed out that while a certain class of apples may be seedless, they contain the usual "core" or carpels. This class of apples, while they have long been known, have not been disseminated to any extent, largely on account of their poor quality.

The claim that these apples are bloomless relates only to the petals; stamens and pistils are present, and are just as liable to injury by late spring frost as are blossoms with petals. The blossom end of the apple, instead of being closed, is more or less open, and this opening extends a considerable distance toward the center of the fruit.

Fruit growers are cautioned against paying fancy prices for seedless apple stock, for at present there is nothing to warrant planting them, in a commercial way at least.

The western sand cherry, N. E. HANSEN (*South Dakota Sta. Bul. 87, pp. 64, pls. 20*).—The sand cherry, *Prunus besseyi*, is a native northwestern prairie fruit which is being cultivated on an extensive scale at the station for the purpose of meeting the demand for a hardy cherry or a satisfactory substitute for it. It is a small fruit and not an orchard fruit, the plants varying from 1 to 4 ft. in height. In cultivation it is recommended that the plants be set 3 ft. apart in rows 6 ft. apart. The plant is perfectly hardy throughout the Northwest. The wild fruit is exceedingly variable in size and quality, but all of it is acceptable for culinary uses. Up to 1903 the author had grown 47,397 sand cherry seedlings. Of this number 31,897 were selected for fruiting and for use as stocks, and from these over 100 varieties have been selected and are now under propagation for preliminary trial.

"Some of these bear fruit from $\frac{3}{4}$ to $\frac{7}{8}$ of an inch in diameter, and of quality acceptable for eating out of hand. It hybridizes readily with several other members of the genus. The fruiting of our numerous hybrids with Japanese plums, native plums, *Prunus simoni*, peaches, nectarines, cherries, and other species is awaited with interest. Some of these hybrids are combinations of at least three species.

"Seedlings fruit well the third year, and under favorable circumstances the second year from seed. When worked on strong native plum (*Prunus americana*) stocks, fruit is borne in abundance upon shoots one year old from the bud or graft. The species responds readily to cultivation. . . . The third generation is decidedly more variable than the first.

"The fruit averages larger when the sand cherries are budded on native plum stocks. . . . It also appears probable that when grown on native plum stocks sand cherries bear better on heavy soils than when on own roots. The plants are remarkably productive when young or on young shoots, but for older plants some system of renewal pruning may be advisable. This species deserves special attention as a dwarf stock for peaches, apricots, Japanese and native plums. Tame cherries unite with difficulty. The past three seasons peaches of normal size have been raised at this station from trees on sand-cherry stocks. These were trees grown in pots, tubs, and boxes, wintered in a cool cellar, and fruited under glass. For orchard purposes

plum trees on this stock must not be high-stemmed, as they get top-heavy and lop over when bearing a heavy crop of fruit. If used at all it must be as a bush with several stems. The trees are not dwarfed in nursery. Evidently the trees should be headed back annually, at least until in heavy bearing, to keep them properly dwarfed. The fruit is fully up to standard in size and quality."

The bulletin contains a complete account with many illustrations of the progress made with this fruit at the station, and also presents a summary of the results of the work done with the fruit at other stations and by nurserymen and growers in neighboring States. It is predicted that "the western sand cherry will be found of great value in the commercial propagation of some of the stone fruits" and that from it "will be developed by selection a race of bush fruits with fruit equal to California cherries in size and of a quality acceptable for table use." There will also be developed from it "a race of hybrid fruits of a new type by hybridizing with choicer fruits; these 'new creations' will be hardy and fruitful on the most exposed prairies."

The "Compass" cherry, a hybrid between the sand cherry and Miner plum originated by H. Knudson, of Springfield, Minn., is illustrated. The fruit is intermediate in season between the sand cherry and plum, very productive, and the flavor sprightly and pleasant. It is considered well worthy of a place in the home garden.

Breeding hardy fruits, N. E. HANSEN (*South Dakota Sta. Bul. 88, pp. 32, pls. 29*).—The author briefly summarizes the work in plant breeding now under way at the station. Numerous cuts are given illustrating his method of work and some of the results obtained with the different fruits. Up to June, 1891, the author had grown seedling fruits as follows: Sand cherry, 8,400; plum, 4,000; grape, 5,000; wild strawberry, crossed with tame, 5,000; native strawberry, 1,000; pin cherry, 25; choke cherry, 360; golden currant, 200; black currant, 2,200; buffalo berry, 180; gooseberry, 425; wild raspberry, crossed with tame, 200; pure native raspberry, 40, a total of 27,030 seedlings.

The work has steadily increased since that date and at the time of writing the number of seedlings had reached fully a quarter of a million. The work is being conducted primarily along two lines, first, by selection from a large number of seedlings, and second, by crossing or hybridizing with cultivated varieties. In the fruit-breeding work at the station perfect hardiness of plant is the first consideration. An effort is being made to extend the cherry, peach, and apricot belt north to the Manitoba line. In the breeding work with vegetables earliness combined with satisfactory yield is the end aimed at.

How to prevent decay of our citrus fruits (*Florida Agr., 31 (1904), No. 39, p. 611*).—This is a reprint of a paper read by T. J. Ashby before the Pasadena Lemon Growers' Association. The author estimates that during the past 8 years the amount of decay for all classes of citrus fruits which have been shipped was 8 per cent. In figures, this represents a loss during this period of about four and a quarter million dollars.

As a means of prevention the author suggests top working with buds taken from trees which produce firm, marketable fruit which will stand shipment. He believes also that in the matter of orchard management the development of the fruit should be retarded rather than forced, since quick growth and rapid decay are terms which are closely correlated.

The author points out the value of dry air in the shipment of fruits and suggests the use of an electric fan with a shaft which would force air to the center of the rooms or cars in which the fruit was kept.

Propagation and marketing of oranges in Porto Rico, H. C. HENRICKSEN (*Porto Rico Sta. Bul. 4, pp. 24, pls. 6, figs. 4*).—A popular discussion of this subject.

Experiments in the aeration and green manuring of the soil in fruit culture, G. BIESENBACH (*Deut. Landw. Presse, 30 (1903), No. 87, p. 752*).—Many orchards in certain parts of Germany do not grow well and are unproductive. The

author conducted some experiments to determine the effect of aeration of the soil in such localities on growth of fruit trees. In transplanting nursery trees to the orchard a hole was dug from 1 to 1¼ meters in diameter and 1½ meters across. Instead of having the hole come to a point at the bottom, as is usually the case in transplanting trees, it was actually made wider at the bottom than at the top. In the case of sandy land, where this kind of a hole could not be dug without danger of caving in, the hole was made wider at the top and the walls dug straight down.

After digging the holes they were allowed to remain open for a few weeks. They were then filled about one-quarter full with brushwood, twigs, leaves, and such material. A layer of earth was then covered over this material and the hole again left for a period of several weeks, after which it was filled up with alternate layers of fine soil, brush, half-rotton wood, and humus. Trees planted in holes thus made have uniformly made a remarkably good growth, and the strong roots thrown out have been able to penetrate the bottom and side walls of the holes into the harder layer of earth.

Excellent results are also reported from the use of hairy vetch, crimson clover, and red clover as cover crops in the orchard.

Results of soil aeration with orchard fruits and its value in general culture, Causemann (*Deut. Landw. Presse, 31 (1904), No. 72, pp. 619, 620*).—The author notes an experiment in the planting of 120 fruit trees, partly along highways and partly in an orchard. The aeration of the soil was secured by digging holes about 1¼ meters deep and a little wider and filling the same with alternate layers of brushwood and soil. All the trees thus treated have made a remarkably good growth in every situation. This method of setting out trees, it is believed, promises much for certain orchard sections of Germany, where unsatisfactory results are now being secured. Some other data are noted showing the value in general of deep preparation of the soil for growing crops.

Pruning, fertilizing, and thinning, J. H. Funk (*Pennsylvania State Dept. Agr. Rpt. 1903, pp. 791–796*).—Directions based on a number of years of successful experience are here given for the pruning, fertilizing, and thinning of orchard fruits.

For transplanting in the orchard the author prefers 1-year-old peach trees, and apple trees not older than 2 years. The trees are pruned to whips and cut off at a uniform height of 18 in. to 2 ft. When the young shoots have grown about an inch all buds below the sixth top ones are rubbed off. Heading in is regularly practiced to induce stockiness and early fruiting. Well-rotted stable manure is recommended during the early growth of the trees. In the author's orchard 6 to 8 year old trees average 6 to 8 in. in diameter, and he finds no difficulty in securing a growth of an inch in diameter each year.

Reports of the pomologist, C. T. Fox (*Pennsylvania State Dept. Agr. Rpt. 1903, pp. 233–243, 536–543*).—Reports are here given for the years 1902 and 1903, on the production of orchard and small fruits in the different sections of Pennsylvania. The Kieffer is grown more largely than any other pear in Pennsylvania. The Numbo and Paragon varieties of chestnuts have been grafted on native trees with much success. The grafts bear fruit in 3 years and the nuts are much larger than the native sorts and command double their price in the market. The varieties of apples, pears, cherries, grapes, peaches, quinces, and strawberries of note which have been originated in the State are mentioned briefly, with an account of their origin. The introduction of Japanese varieties of plums in Pennsylvania has given new life to that industry.

Fruit-growing statistics of Erie County, L. G. Youngs (*Pennsylvania State Dept. Agr. Rpt. 1903, pp. 715, 716*).—Erie County in Pennsylvania borders on Lake Erie. It contains 50,000 acres of grape land, of which 6,000 acres have been planted. The normal annual production of grapes is 1,800 carloads, valued at $600,000. The annual value of berries and other small fruits is $300,000. About 400,000 bu. of

apples are produced in the county, "95 per cent of which are only fit for cider." The value of the fruit and produce used by canning factories is placed at $150,000.

Plowing v. mulching (*Amer. Gard., 25 (1904), No. 505, p. 662*).—An account is given of an experiment in cultivating v. mulching peach orchards. The orchard in question was that of J. H. Hale, in Connecticut. It is stated that the mulched trees made a growth that many people would have been satisfied with, but much better results were secured by cultivation. The cultivated trees made a better growth, and the leaves were larger and of a deeper green color. It was an easy matter to pick out by appearance the cultivated from the mulched trees in the different sections of the orchard.

Cooling peaches before shipping (*Orange Judd Farmer, 37 (1904), No. 16, p. 359*).—As the results of investigations by G. H. Powell of this Department, in Georgia, it is stated that if peaches are cooled quickly to about 40° before being loaded in refrigerator cars, they will carry to the most distant northern markets without loss. "Nine full carloads were included in the cooling tests, and check cars cooled in the ordinary way accompanied them to New York and New England markets. The cooled fruit arrived in practically the same condition in which it left the orchard, in uniform condition from the bottom to the top of the car. In the check cars there was as much as 30 per cent soft and decayed fruit in the top layers of peaches. In some cases the fruit was sold after 14 days in the cold car in prime condition." It is believed that the investigations indicate that a large proportion of the usual losses in transit of the peach can be overcome if the temperature of the fruit can be reduced quickly after picking. The body of ice in an ordinary refrigerator car does not reduce the temperature quickly enough to check ripening, and the fruits deteriorate at the top, where the temperature is highest.

Cold storage for fruit (*West Indian Bul., 5 (1904), No. 2, pp. 117–134*).—This article is made up largely of a series of interviews with the managers of important cold-storage plants in the United States on the methods followed in their work in the cold storage of fruits.

Graft hybrids (*Gard. Chron., 3. ser., 36 (1904), No. 926, pp. 217–219, figs. 5*).—A review is given of the work of L. Daniel in producing graft hybrids, and of earlier work of a similar nature by others. A number of cuts of graft hybrids illustrate the article.

Coffee and coffee culture, C. B. HAYWARD (*Sci. Amer., 91 (1904), No. 12, pp. 194, 195*).—A brief account of the early history of coffee, and the various stages of development from flowering to the manufactured product.

Coffee planting in Porto Rico, J. W. VAN LEENHOFF (*Porto Rico Sta. Circ. 5, pp. 14, figs. 6*).—Popular directions are given for the planting and management of coffee plantations in Porto Rico. The article is preceded by an account, by F. D. Gardner, on the experimental work now being carried out at the station with coffee. Special attention is being paid to planting at different distances and to different cultural methods. Experiments to control the coffee-leaf miner, by picking and destroying all infested leaves, have been made on several occasions, but the indications are that the task is too great to be practicable. The circular is also issued in the Spanish language.

Comparative study of different methods of pruning, B. CHAUZIT and G. BARBA (*Rev. Vit., 22 (1904), Nos. 554, pp. 92–95; 555, pp. 122–126*).—The authors conducted a series of experiments extending over a number of years with different methods of pruning vinifera varieties of grapes to determine the effect on yield and quality of the wine produced. The results obtained are tabulated as regards yields during 9 seasons, and the composition of the must as regards sugar, acid, alcohol, extract, ash, etc.

The final conclusions regarding the matter are as follows: Long-pruned vines trained on wires are more prolific, other things being equal, than vines pruned and

trained in goblet form, and manifest after 9 years' trial no sign of enfeeblement. Fruit from long-pruned vines ought to be harvested 15 to 20 days later than fruit from vines subject to ordinary short pruning, in order to improve the quality of the wine produced. Even when long-pruned vines are harvested later they never produce as perfect a quality of wine as short-pruned vines, because the fruit does not reach such perfect maturity. The total amount of sugar material harvested per hectare is much greater in long-pruned vines than in those pruned short.

The growing of raspberries for profit, P. HARRIS (*Pennsylvania State Dept. Agr. Rpt. 1902, pt. 2, pp. 123–127*).—The author describes his successful method of growing raspberries for profit. Details are given as regards methods of planting, pruning, and varieties. The Loudon has been adopted as the best of a number of varieties of red raspberries tested. The Kansas is considered the most satisfactory of the black varieties. It leads as regards yield and profit.

Strawberry handbook (*New York: German Kali Works, pp. 32, figs. 9*).—Popular directions are given for the planting, manuring, and general care of strawberries. Several tables are included which show the composition of the more common commercial fertilizers and manures.

Report on latices and rubber from Rhodesia, W. R. DUNSTAN (*Rhodesian Agr. Jour., 2 (1904), No. 1, pp. 23–25*).—Analyses are given of a number of samples of latices from different rubber-producing plants in Rhodesia, and also of a sample of rubber from the Umtali district.

Rubber coagulating methods in Central Africa, G. VAN DEN KERCKHOVE (*India Rubber World, 31 (1904), No. 1, pp. 5–7, figs. 8*).—A number of different methods used by the natives in Central Africa for coagulating rubber are briefly described. Supplementing the article is a paper on the coagulation of root rubber, republished from a recent work by De Wildman and Gentil.

A grand novelty (*Gard. Chron., 3. ser., 36 (1904), No. 927, pp. 240, 241, fig. 1; Sup., pl. 1*).—An account is given of the plant *Meconopsis integrifolia*, which has lately flowered in several establishments in England for the first time. The plant is native in Tibet, where it grows at elevations above 11,000 ft. Its upward limit appears to be about 15,500 ft. The flowers in Tibet are 8 to 10 in. in diameter and of a beautiful yellow color. There are about 11 flowers on each plant in Tibet, but under cultivation 4 to 5 flowers appear to be the normal number. The petals are normally 5 in number and borne erect something like a tulip. It is believed that this flower will prove among the most valued Papaveraceous species in cultivation. A botanical description is given of the plant.

FORESTRY.

Forest resources of Texas, W. L. BRAY (*U. S. Dept. Agr., Bureau of Forestry Bul. 47, pp. 71, pls. 8, figs. 2, maps 3*).—After briefly describing the conditions affecting the character and distribution of forest growth in Texas and the natural divisions of the State, a discussion is given of rainfall, nature of soil and rock, temperature, sunlight, winds, etc., as factors in determining forest distribution in Texas. The different forest areas are classified and their chief characteristics described. Notes are given on the commercial value of the different forest areas, forestry practices, etc., and suggestions for the conservative management of lumbering the remaining timber.

The author says that in spite of the hopeful beginning that has been made in the private management of the long-leaf pine, without State aid it will be impossible to protect the public interests affected by forest destruction. The long-leaf pine lands under present conditions are practically without reforestation, and on loblolly and short-leaf pine lands the reforestation is rapid enough, but in most places the pine is replaced by scrub oak.

The author believes that the State should assist by promoting management by private owners and by itself undertaking the management of forests on State lands. He claims that forest preservation, in the interests of the State of Texas as a whole, can be obtained only by the adoption of a definite State policy which would not only meet the present needs, but would include assistance to private management and the establishment of State reservations. The bulletin concludes with a list of the valuable timbers native to Texas, with notes on their distribution, habits, and uses.

The forests of the Hawaiian Islands, W. L. HALL (*U. S. Dept. Agr., Bureau of Forestry Bul. 48, pp. 29, pls. 8*).—This is a report on the forests of Hawaii, based on the recent reconnoissance of the forests, and contains recommendations which form the basis of a forest policy which is being put in effect by the Territorial government. The bulletin is an elaboration of a previous publication (E. S. R., 15, p. 778).

Exhibit of a forest nursery at the Louisiana Purchase Exposition, G. PINCHOT (*U. S. Dept. Agr., Bureau of Forestry Circ. 31, pp. 7, figs. 2*).—As a portion of the outdoor exhibit of the Bureau of Forestry at the Louisiana Purchase Exposition, a demonstration is made of forest nurseries in which different methods of seeding for coniferous and deciduous trees are described, as well as the use of screens for suitable shade, etc.

Exhibit of forest planting in woodlots at the Louisiana Purchase Exposition, G. PINCHOT (*U. S. Dept. Agr., Bureau of Forestry Circ. 30, pp. 11, fig. 1*).—In order to illustrate different methods of forest planting in woodlots, the Bureau of Forestry has prepared, as a part of its outdoor exhibit at the Louisiana Purchase Exposition, a series of plats planted with different species and mixtures suitable for different parts of the United States. The woodlot plantations are made primarily for the production of fuel and timber, and the selection of species is based on this fact. A description is given in tabular form of the different woodlot plantations.

Forest conditions of the San Francisco Mountains forest reserve, Arizona, J. B. LEIBERG, T. F. RIXON, and A. DODWELL (*U. S. Geol. Survey, Prof. Paper 22, pp. 95, pls. 7*).—This is a report on the forest conditions of the San Francisco Mountains reserve, in which the various physical features are described and detailed notes given on the character of the forests. The reserve contains nearly 2,000,000 acres, and the report is based upon a critical examination of 812,500 acres. The different zones or types of arborescent growth are described, and notes given on the undergrowth, ground cover, etc. The principal species of trees are the yellow pine, which supplies by far the greatest amount of timber, followed by red fir, white fir, Engelmann spruce, and other species of less abundance and value.

Notes are given on the various agencies through which the forests are being destroyed. Logging operations have been carried on in most of the forest area in the central part of the reserve, in some places the timber having almost all been cut. The effect of grazing, especially sheep herding, is described, and also the injury which has been caused by forest fires. The reproduction of species, particularly the yellow pine, is very deficient, and the yellow pine is said to be as a rule past its prime and in a state of decadence. The grazing value of the reserve is commented upon, the principal species of grasses being enumerated. A detailed description is given of the different townships embraced in the reserve.

The disappearance of the chestnut in France (*Bul. Mens. Off. Renseignements Agr., 3 (1904), Nos. 1, pp. 11–29; 2, pp. 163–177*).—The importance of the chestnut tree in France is commented upon and official data given relating to the value of its products. These increased to about 1890, from which time there has been a steady decrease in the production and value of the products. This is attributed to the destruction of the trees through various means. One of the most important is the cutting of the trees for the bark, which is rich in tannin.

A second and very important cause is a disease due to an unknown cause which produces exudations on the lower part of the trunk and roots. A review is given of the various attributed causes of this disease and the opinions of a number of investigators are summarized. Chapters are given on the utilization of the bark and wood of the chestnut, and suggestions made for its more conservative management. The paper concludes with a list of about 50 references to the literature of the subject, which is appended as a bibliography.

On the reestablishment of chestnut forests, A. PRUNET (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 5, pp. 536-541*).—Attention is called to the destruction of chestnut trees through the disease known as "black foot" or "ink disease." For the reestablishment of the forests the author suggests planting trees that have been grafted upon resistant stock, and for this purpose he recommends grafting on other species of chestnut, on the American chinquapin (*Castanopsis chrysophylla*), and also upon certain species of oak which have been demonstrated as suitable stock for that purpose.

The timber of the Edwards Plateau of Texas, W. L. BRAY (*U. S. Dept. Agr., Bureau of Forestry Bul. 49, pp. 30, pls. 5, map 1*).—This bulletin gives an account of the timber of the Edwards Plateau of Texas, and discusses its relation to climate, water supply, and soil. After describing the region, which lies east of the Pecos Valley and north of the Rio Grande River, an account is given of its climatic conditions, water supply, etc., and the vegetation of the region is described at some length.

Progress report of forest administration in Coorg, C. D. MCCARTHY (*Forest Dept., Coorg, India, Rpt. 1902-3, pp. 28*).—A report is given on the forest administration for the years 1902 and 1903, with notes on the extension of State forests, their management, exploitation, gross yield of products, and the financial returns. The reserved and protected forests amount to nearly one-third of the entire area of the district.

Forestry in Japan (*Japan in the Beginning of the 20th Century. Tokyo: Imperial Japanese Commission to the Louisiana Purchase Exposition, 1904, pp. 224-288*).—The forest area of Japan is said to be about 56,563,000 acres, or 59 per cent of the total area of the islands. Of this area 21 per cent is pure coniferous forest, 25 per cent deciduous, 45 per cent mixed, and the remainder thinly stocked or waste lands. The bamboo areas, which form a feature in the forest system of Japan, are of extremely limited extent, and are said to show little signs of enlargement in the near future. A description of them has therefore been omitted.

The ownership of the forests and relative extent of different classes are given as follows: Government forests 32,156,000 acres, imperial forests 5,122,000 acres, and private forests 19,281,000 acres. The distribution of the forests, sylvicultural features, etc., are described, and notes given on the more important species of trees found in the different forest zones. The various systems of management are described and the results of elaborate investigations which have been inaugurated by the government for the study of forest conditions and improvements are shown.

In the government forests rotations of from 40 to 200 years have been adopted, dependent upon the species grown, and private owners are being urged to adopt similar methods. Encouragement is given to public and private forest planting so as not only to reproduce the forest as it matures, but also to replant extensive areas which were deforested after the political restoration. The only figures available are for the government and imperial forest plantings for the decennial period ending 1901. During this time there was an extension of the forest area by 2,805,000 acres.

The financial returns from the state forests for the year 1901 were in excess of $1,000,000, rating the Japanese unit of value at 50 cts. The tables given show a progressive net profit for the time covered, as well as an increased revenue per unit of area.

The management of the state forests is conducted by 16 major and 325 minor forest officers, organized under a Bureau of Forestry of the Department of Agriculture and Commerce. Other systems of management are permitted, a considerable number of areas being under local control.

Brief notes are given on forestry education and legislation. The first school of forestry, the Tokyo Dendrological School, was established in 1882, and at present there are 62 institutions of various grades in which instruction in forestry is given.

Forestry in the south of Ireland, R. H. KEANE (*Agr. Students' Gaz., n. ser., 12 (1904), No. 1, pp. 17–22*).—Descriptions are given of the forests of the south of Ireland, a region which was formerly completely forested, but which has suffered very materially from the removal of the timber and destruction of the forests. At present it is said that only 1.5 per cent of Ireland is wooded, the total area of forest being about 308,000 acres. This area embraces larch 46,000 acres, fir 34,000, oak 26,000, spruce 15,000, pine 2,500, beech 10,000, ash 7,000, elm 3,300, sycamore 3,000, and mixed forests 159,000.

Attention is called to the rapidity with which a number of species of forest trees grow when given proper attention, and suggestions given for future plantings. The prevailing forest crop is said to be a mixture of larch and Scotch fir, with a considerable amount of scrub oak, which is desirable only for fire-wood. The commoner varieties of trees and their suitability as regards soil and climate are described.

Review of forestry legislation for 1902, G. B. SUDWORTH (*New York State Library Bul. 80, pp. 839–843*).—During the period covered by this review it is said that 7 States enacted forest legislation, of which only 4 could be properly classified as forest laws. Of these, the laws of New York, providing for the establishment of a State park, and the New Jersey fire law are noteworthy. The provisions of these laws are reviewed and commented upon at some length. Other laws briefly reviewed are those passed by the legislatures of Ohio, Rhode Island, and Louisiana.

Practical notes on forestry for New South Wales, J. H. MAIDEN (*Agr. Gaz. New South Wales, 15 (1904), No. 4, pp. 341–344*).—Notes are given on the selection and propagation of forest tree seeds, means of testing, etc., and attention called to the necessity of rejecting inferior species in planting. The author describes the preparation of the soil for nursery beds, and gives directions for the care of the seedlings. The propagation of trees by other means than by seeds is described.

Forest conditions of the Black Mesa forest reserve, Arizona, F. G. PLUMMER, T. F. RIXON, and A. DODWELL (*U. S. Geol. Survey, Prof. Paper 23, pp. 62, pls. 7*).—This report was prepared by the first of the above-mentioned authors from notes made by the other two. The Black Mesa forest reserve contains approximately 1,783,000 acres, and extends in irregular strips of land from central Arizona in a southeasterly direction to the New Mexico boundary. The general topography of the region is described, as well as its drainage, water supply, lumbering operations, etc.

The lands of the forest reserve are classified as timbered area 80.7 per cent, woodland 14.04 per cent, timberless 5.02 per cent, and burned and logged area 0.24 per cent. The dominant species of timber trees of the reserve are the yellow pine, followed by Engelmann spruce, white pine, and red and white fir. In addition to the above species there is a considerable amount of oak, juniper, and cypress, which is of value for fuel.

Descriptions are given of the different species of trees, and notes on the rate of growth of the principal timber species. The report concludes with detailed descriptions of the townships embraced in the reserve.

Street trees and gas (*Amer. Gard., 25 (1904), No. 503, pp. 624, 625, fig. 1*).—Attention is called to the damage frequently suffered by street trees, which is attributed to the effects of illuminating gas, and quotations given from the report of the forester of Yonkers, N. Y., in which a number of instances are cited where trees were undoubtedly destroyed by leaks in gas mains.

The hardy catalpa, W. GILL (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 11, pp. 614-616, pl. 1*).—A description is given of the hardy catalpa as a forest tree, particular attention being called to a number of plantations in parts of Australia. These plantings were made along small streams in rich soil, and the growth has been exceptionally rapid.

The results obtained in Australia are contrasted with those obtained in the United States, as shown by the publications of the Bureau of Forestry, some of the experiment stations, etc., and the author concludes that the growth of the trees in South Australia suffers little by comparison with the trees as grown in the United States. Attention is called to one important difference, however, that is, that while the tree in this country grows over a large area and in many kinds of soil, in South Australia it was found to succeed only on selected sites in close proximity to a permanent water supply.

Planting red cedar (*Oklahoma Sta. Rpt. 1904, pp. 54-56*).—Directions are given for the gathering of the seed of the red cedar, its preparation for planting, and subsequent care. The best results seem to follow the storing of the seeds in moist sand, and as they do not germinate until the second spring after planting, they should be protected against excessive drying during the summer. Notes are also given on Arbor Day as observed in Oklahoma, and a list of desirable trees for planting is given.

White oak and other southern woods (*Tradesman, 52 (1904), No. 2, pp. 73, 74*).—Notes are given on a number of species of oak which in the lumber market are frequently substituted for the true white oak. The species described are the basket oak (*Quercus michauxii*), chestnut oak (*Q. prinus*), and the chinquapin oak (*Q. prinoides*). The timber characteristics of these different species are described, and their differences when compared with white oak are contrasted. In addition notes are given upon a number of other species of oak, gum, and other timber trees.

Cross-tie forms and rail fastenings, with special reference to treated timbers, H. VON SCHRENK (*U. S. Dept. Agr., Bureau of Forestry Bul. 50, pp. 70, pls. 5, figs. 71*).—The treatment of ties used in railroad construction to preserve them against decay has made it possible to introduce new forms, a number of which are described and discussed. The relative value of different forms, the value of ties cut from live and dead timber, the desirability of decreasing the number of ties used per mile of track, and new types of ties are all discussed.

The author concludes that the present classification into first class, second class, etc., is not justified, and suggests a grading based on a certain definite-sized tie. Under the present system of management it is not deemed desirable to decrease the number of ties now laid per rail length. Triangular ties, which have been exploited to some extent, are not considered desirable and should not be used, as they are said to yield less bearing surface on the ballast than other forms.

Where tie plates are used on treated timbers of inferior grade, the requisition of an 8-inch top-bearing surface is believed to be wasteful. The half-round tie, which is described, is believed to be advantageous from a mechanical standpoint, as it is said to give greater bearing surface per mile and a more stable track, and at the same time it is more economical of timber. Experiments are in progress to test the practicability of sawing ties of this form in large numbers, and their value is believed to be worthy of trial.

The author takes up the different forms of rail fastenings, discussing spikes, screw spikes, etc., at considerable length. The best form is believed to be a screw spike now in use on the French Eastern Railway. This screw combines the advantages of ease of making, cheapness, and longer service than other types of screws, and is said to wear out the thread of the wood less than closer wound screws. Tests of these are being conducted on several railroads in the United States.

A discussion is given of the relative value of different tie plates. For use in old ties, or ties which have been in use for some time until the spikes or screws become

loosened, a form of dowel is described which has already shown remarkable results in the way of preventing wear around the spike and preserving the tie for a considerable period beyond the usual time of its usefulness.

The preservative treatment of wood, S. P. Sadtler (*Tech. Quart., 17 (1904), No. 2, pp. 129–144, figs. 3*).—After discussing the objects of wood preservation, notes are given on the structure and chemical composition of various woods, and the more common methods of preservative treatment are described. Attention is called to a radical departure from some of these methods of treatment, and a new method for railroad-tie protection is described at considerable length. This protects not only against fungus attacks, but renders the wood fireproof or fire resistant to a considerable degree.

The method described is said to give to wood a fire-resistant quality, due to the use of aluminum sulphate, without any injury to the structural strength of the wood or the production of any deleterious characters in the product.

The timbers of commerce and their identification, H. Stone (*London: William Rider & Son, Ltd., 1904, pp. XXXVIII+311, pls. 23*).—The author has produced a valuable contribution to the knowledge of commercial timbers and means for distinguishing them. The information given is both scientific and technical, the two being combined in a way to aid in the identification of nearly every kind of timber found in the market.

More than 200 species of wood are described and every genus is figured by excellent photomicrographs which go to make up the plates. After an introduction to the study of woods, the author describes in detail 247 kinds of wood, giving the botany of the species, distribution, sources of commercial supply, physical characteristics, uses, anatomical characters, etc. A bibliography of more than 130 references to literature relating to the subject is given, and a thorough index enables one to readily make use of the text.

No attempt is made to supply keys to the species, as the author thinks the present status of information does not warrant their construction if based upon any systematic classification of the plants.

SEEDS—WEEDS.

The duration of germination experiments, F. Nobbe (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 473–480*).—The results of a series of experiments on the germination of seed of Scotch pine, fir, and beet to test the reliability of the rules of the German experiment stations are given. The pine seeds were counted 7, 10, 14, 21, 28, and 42 days from being placed in a germinating chamber, and the fir seeds after 7, 10, 14, 21, and 28 days.

A great variation was noted in the rate of germination of the different lots of seed, but the average germination for the lots of pine seed was 72.7 per cent at the end of 42 days, with 5.8 per cent still fresh and apparently viable. With the fir seed, the average germination was 75.7 per cent in 28 days, with 6.1 per cent still fresh. In experiments with beet seed a variation of 18 per cent was noticed between the germinations determined 5 days and 14 days after beginning.

Effect of bad weather on the vitality of seed oats (*Jour. Bd. Agr. [London], 11 (1904), No. 4, pp. 217–219*).—An account is given of some experiments carried on at the Agricultural Department, Marischal College, Aberdeen, to determine the effect of an abnormal season on the vitality of seed oats. Most of the samples tested were taken either from seed stacks or from granaries, and were selected because they had been exposed in the shock for a longer or shorter time to inclement weather.

Of 34 samples the highest germination was 63 per cent and the lowest 16 per cent, giving an average germination of 34 per cent. Samples of grain that had stood in

the shock from 3 to 6 weeks during rainy, misty weather showed a diminished average germination dependent upon the time the grain was exposed to the weather. The relation between the weight per bushel and the germinating power of a number of samples is shown, from which it appears that in general the germinative ability of seed increases with its weight per bushel.

Twenty-sixth report of the Swiss seed control station at Zurich, F. G. STEBLER ET AL. (*Landw. Jahrb. Schweiz, 18 (1904), No. 2, pp. 45-100, figs. 4*).—A report is given of the operations of the station in testing seeds for the year ended June 30, 1903. During this period 10,274 investigations were made and the maximum, minimum, and average germination of the different kinds of seed are reported. These investigations represented 339,203 kg. of seed. In addition to the germination and purity tests, examinations were made for dodder seed. The relative value of different kinds of clover seed, alfalfa, vetches, and various grasses was also studied. The average purity and germination of all samples of seed tested between 1876 and 1903 are shown in tabular form.

In addition to notes on seed testing, descriptions are given of investigations on certain plant diseases, including a leaf-spot disease of English rye grass caused by *Ovularia lolii* and a leaf-spot disease of white clover due to *Stagonospora trifolii*.

Second annual report of the Central Seed Testing Laboratory of the Aynsome Agricultural Station, Grange-over-Sands, J. S. REMINGTON (*Ann. Rpt. Cent. Seed Testing Lab., Aynsome Agr. Sta., Grange-over-Sands, 2 (1903-4), pp. 50*).—An account is given of the seed-testing operations conducted during the season 1903-4. There were examined during this time 1,077 samples of seeds of all kinds, an increase of about 75 per cent over the amount tested the previous year. A detailed report is given of the results of the different tests, in which the purity, germination, presence of dodder, etc., are shown. In addition to the tabular statements given, the forms of blanks used at the station are shown.

Modern seed testing (*Reprint from Mag. Com., 1903, Oct., pp. 7, figs. 8*).—The importance of good seed and the necessity for scientific and systematic seed testing are shown, and a description given of the Aynsome Seed Testing Station.

Seed testing, J. S. REMINGTON (*Reprint from Roy. Lancashire Agr. Soc. Jour., 1903, pp. 8*).—A description is given of methods of seed testing pursued in the Aynsome Seed Testing Laboratory, and tables given showing the maximum and minimum of purity and germination of different varieties of seed as determined by investigations which have been carried on at the station.

Technical rules for seed testing, J. S. REMINGTON (*Grange-over-Sands, Eng.: Aynsome Agr. Sta., 1903, pp. 8*).—The technical rules for seed testing as practiced at the Central Seed Testing Laboratory of the Aynsome Agricultural Station are given.

Seed testing and seed-testing apparatus, H. WICHMANN (*Mitt. Österr. Vers. Stat. u. Akad. Brauind. Wien, 1904, pp. 7-11; separate from Allg. Ztschr. Bierbrau. u. Malzfabrik., 1904, Mai*).—A report is given of experiments on the germination of barley, in which comparative tests of different forms of germinating apparatus were made.

A report on present methods and standards of seed testing, A. VOIGT (*Separate from Jahresber. Ver. Vertreter Angew. Bot., 1 (1903), pp. 1-11*).—The author discusses methods of seed testing and standards which are followed in some of the countries of Europe.

Selection of seed by chemical methods, WOOD and BERRY (*Proc. Cambridge Phil. Soc., 12 (1903), No. 2; abs. in Bot. Centbl., 95 (1904), No. 19, p. 513*).—Studies are in progress to determine the possible relationship between the chemical composition of beets, ruta-bagas, and mangel-wurzels, and the ability to transmit these characteristics through their seeds.

DISEASES OF PLANTS.

Report of the government mycologist, J. B. Carruthers (*Admr. Rpts., Roy. Bot. Gardens, Ceylon, 1903, Misc., pt. 4, pp. 5–10*).—Considerable attention is given to a disease of tea leaves due to the fungus *Pestalozzia guepini*. This fungus causes a disease known as "gray blight" and occasions at times serious losses to tea plantations. Another serious disease of tea is due to the root fungus *Rosellinia radiciperda*. A third disease which is said to rarely attack tea in Ceylon, though abundant in other districts, is due to the fungus *Marasmius sarmentosus*.

In addition notes are given on the witches' broom of cacao, caused by a species of Exoascus, and rubber canker which are to be discussed in future publications. A brief note is given on the resistance of the spores of *Hemileia vastatrix* to sunlight, so far the spores resisting the direct action of the sun to a very high degree.

Annual report on the diseases and injuries of economic plants, A. A. Yacheoski (*St. Petersburg: Min. Agr. and Imp. Domains, 1904*).—This is the first annual record for 1903 of the Central Phytopathological Station, established by the Imperial Botanical Garden. The present record deals with the diseases of cereals, fodder grasses, garden plants, fruit trees, berries, vines, forest species, orchard and decorative plants, and tropical and subtropical plants.—P. FIREMAN.

Diseases of cereals, D. McAlpine (*Jour. Dept. Agr. Victoria, 2 (1904), No. 8, pp. 709–721, pls. 2, dgm. 1*).—In an address delivered before a convention the author describes a number of diseases of cereals, paying particular attention to rust and take-all. He presents statistics to show the losses attributed to rust in Australia, and reviews the various experiments for its control. The most promising method for the control of rust seems to be in the selection of resistant varieties, and a variety known as Rerraf is said to be able to withstand the rust when other varieties alongside of it were almost entirely destroyed. Other promising rust-resisting varieties are mentioned. For the prevention of take-all the author recommends a series of rotations which does not include wheat or other susceptible plants for a number of years.

Clover rot, W. Freckmann (*Deut. Landw. Presse, 31 (1904), No. 5, pp. 452–454, figs. 6; Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 8, pp. 915–918*).—A description is given of a clover disease caused by *Sclerotinia trifoliorum*, which is said to have been quite prevalent in portions of Europe, causing great injury to clover fields. It becomes conspicuous in September and October, when the leaves present brown spots bordered with yellow, and in about 15 days the entire leaf is affected and finally falls, leaving the plant bare. The development of the fungus is discussed at considerable length. In addition to the ordinary red clover, it has been found to attack crimson, alsike, and white clovers, sainfoin, alfalfa, and other leguminous plants.

Where a field becomes infested with this fungus it is recommended that the cultivation of clover and similar crops be abandoned for a time and the land seeded to grass or given to the cultivation of cereals. If the disease appears to a slight extent in clover fields its effect may be diminished by sowing grass seed, which will gradually replace the clover as it is destroyed and finally result in the production of a meadow.

A disease of endive (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 3, pp. 295, 296*).—A brief account is given of a notice published elsewhere of a disease of endive, which has been quite prevalent in parts of Italy. The disease seems to be caused by the fungus *Puccinia prenanthidis*, which causes rusted spots upon the leaves, destroying the plant for use as salad. The progress of the disease is said to be quite rapid, the pustules spreading until the leaf is fully involved and later transformed into a worthless mass.

On account of the use of the plant as a salad, fungicides can not be readily used for its protection. On this account the author recommends careful selection of plants,

the rejection of all which show any traces of disease, and rotation of crops so that endive shall not be cultivated in the same ground for 2 years in succession.

The scab of potatoes (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 8, pp. 924, 925*).—A brief account is given of the black scab of potatoes, due to *Œdomyces leproides* or *Chrysophlyctis endobiotica*, the information being largely based upon publications of the Board of Agriculture of England.

The diseases of the potato in relation to its development, L. R. JONES (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903) pp. 163–175, figs. 8*).—This is a lecture delivered by the author, and is based on investigations carried on at the Vermont Station, all of which have been noted elsewhere.

The biology of Phytophthora infestans, L. MATRUCHOT and M. MOLLIARD (*Ann. Mycol., 1 (1903), pp. 540–543; abs. in Bot. Centbl., 95 (1904), No. 6–7, p. 158*).—Biological studies are given of the potato rot fungus (*Phytophthora infestans*). The fungus was grown on a number of media, including sliced potatoes, cucurbits, etc., and on artificial media of various kinds. The best spore formation was found when grown on natural media, as they are called, growth on an artificial media tending to sterility.

A bacterial rot of onions (*Agr. News [Barbados], 3 (1904), No. 60, p. 245*).—A description is given of the bacterial rot of onions, which was noted in Barbados as affecting the inner scales of the bulb after the crop had been gathered and stored. No fungus was found present, but the diseased scales were swarming with bacteria. While not demonstrated, it is believed that this disease is similar, if not identical, with that previously described by F. C. Stewart, of the New York State Station (E. S. R., 12, p. 55).

Some root-crop diseases in Ireland, T. JOHNSON (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1903), No. 2, pp. 258–263, figs. 8*).—The author describes a disease of mangel-wurzels due to *Œdomyces leproides*, a dry rot caused by *Sphærella betæ*, and a rot of Swedish turnips caused by *Phoma brassicæ*.

Disease of sorghum in the Madras Presidency, C. A. BARBER (*Dept. Land Records and Agr., Madras, Vol. II, Bul. 49, pp. 273–288*).—Descriptions are given of some of the fungus and insect injuries to sorghum, particular attention being given to sorghum smut, 2 forms of which are described as due to *Ustilago reiliana* and *U. tulasnei*. For the prevention of these diseases, the author recommends immersing the seed grain in a copper sulphate or a formalin solution prior to planting. Other diseases due to *Colletotrichum falcatum*, *Puccinia penniseti*, etc., are described.

Experiments for the prevention of black spot or scab of apples, D. MCALPINE (*Jour. Dept. Agr. Victoria, 2 (1904), Nos. 4, pp. 354–360; 8, pp. 761–767, pls. 9*).—A report is given of a series of experiments conducted to test the efficiency of Bordeaux mixture when employed on a commercial scale and also to ascertain the adhesiveness of various fungicides when used for the prevention of the black spot or scab of apples and pears. The first series of experiments was conducted in 1902–3, followed by a second series of experiments in 1903–4.

In the first experiments it was shown that with proper spraying with a well-prepared Bordeaux mixture the disease could be completely controlled. The additions of common salt, sal ammoniac, etc., while slightly increasing the efficiency of the fungicide, are not believed to be necessary. The second season was generally favorable for the development of fungus diseases, and in many instances the attacks were prolonged unusually late in the season. In a large number of orchards a second definite period of infection was observed after the usual primary infection. As in the previous experiments the disease was found to be readily controlled by the use of Bordeaux mixture, and from the results obtained a 6–4–40 formula is preferred.

A precocious decay of Botrytis in Algeria, L. TRABUT (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 11, pp. 229–232, figs. 2*).—An account is given of an unusual decay of *Botrytis cinerea* on grapes in Algeria in which the flowering clusters, early foliage, young shoots, etc., were badly infested.

The scab or verrucosis of lemons, G. BRIOSI and R. FARNETI (*Atti. Ist. Bot. Univ. Pavia, 2. ser., 10 (1904), p. 60; abs. in Bot. Centbl., 95 (1904), No. 19, p. 515*).—A description is given of a disease of lemons and citrons in Sicily, which is supposed to be the same as the disease known in this country as scab or verrucosis. A study of the fungus has led the authors to describe it as belonging to a new genus, *Rhynchodiplodia citri*.

Mummy oranges and citrons (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 6, pp. 691–693*).—A summary is given of an article published in *Agricoltura Moderna*, in which is described a disease of oranges and citrons which results in the drying and hardening of the fruits. The fruits are found to be attacked by fungi, the principal of which is said to be *Botrytis citricola*, n. sp. This fungus is said to be parasitic and is thought will prove of considerable importance to the orange and citron groves of Italy. It is closely related to *B. cinerea*, but differs in some material respects which are described.

For the prevention of the spread of the disease, particularly to fruits that have been gathered, the author recommends the rejection of all which show any rusted spots upon the skin and storage of the fruit in well aerated and dry places only.

The pineapple disease, H. TRYON (*Queensland Agr. Jour., 15 (1904), No. 1, pp. 477–484*).—A discussion is given of a disease of pineapples, the presence of which may be recognized by the modified appearance of the plants. Their ordinary dark-green color gives place to red and yellow, the plants become wilted, the leaves twisted, and later a brownish coloration is quite noticeable. After the disease becomes well established its presence can be observed in the unevenness of the rows, the stunted, discolored plants being quite conspicuous.

The author describes various agencies that have been suggested as the cause of this disease, and from his investigations is led to believe that it is due to the presence of some undetermined fungus which attacks the roots, causing their decay. The presence of the fungus, however, is believed to depend upon a weakened condition of the plants, which is primarily caused by the soil not being in condition for healthy growth.

Investigations on the coffee disease due to Stilbella flavida, F. G. KOHL (*Beihefte Tropenpflanzer, 1903, No. 2, pp. 61–77; abs. in Bot. Centbl., 95 (1904), No. 13, pp. 335, 336*).—Based upon abundant material from coffee plantations in Central America, the author has made a study of the coffee-disease fungus, formerly known as *Stilbum flavidum*. By studying it in pure cultures he has determined the fungus to be a hymenomycete and not in any way connected with *S. vulgare*, a basidiomycetous fungus, which is the type of the genus. On this account he proposes a new name, *Stilbella flavida*, and points out a number of fungi which have been described by various authors and which he claims should be referred to it.

For combating the disease he recommends the collection and destruction of all diseased and fallen leaves, twigs, fruits, etc.; the destruction of all young diseased plants; the stimulation of plants to active growth by the use of proper fertilizers, irrigation, drainage, etc.; the reduction of shade; the pruning of the trees, and finally by the active use of fungicides.

A new cacao disease (*Agr. News [Barbados], 3 (1904), No. 62, p. 281*).—The occurrence of a disease affecting the twigs and leaves of cacao in St. Lucia is reported. The external appearance of the twigs is said to be quite characteristic, the hyphæ of the fungus being joined together into dark-colored threads resembling in a way loose bunches of horse-hair. A similar disease has been reported as occurring on tea in India and Ceylon, which it was found possible to prevent in those countries by careful pruning and the use of a lime-sulphur wash. So far as the author's information goes, this disease has not been previously reported as occurring on cacao in the West Indies.

The leaf cast of Pinus cembra, H. C. SCHELLENBERG (*Schweiz. Ztschr. Forstw.,*

55 (1904), No. 2, pp. 44–48; abs. in Bot. Centbl., 95 (1904), No. 21, pp. 569, 570).—The leaf-cast fungus of the common pine is shown by inoculation experiments to be able to infect *Pinus cembra*. Under natural conditions the disease is transferred to the young needles when growing in moist shaded regions, and especially when the branches are near the ground. This last factor is due, in the author's opinion, to the fact that the fruiting of the fungus takes place on the fallen leaves. By the extensive shedding of its leaves the tree becomes greatly weakened and often killed.

In appearance the disease resembles that of the common pine except that the leaves infected in the spring of the year fall that autumn instead of being carried over until the following spring. The fungus, *Lophodermium pinastri*, is described at some length.

The nutrition of diseased trees with the object of curing them and destroying their parasites, I. J. SHEVIRYEV (*Selsk. Khoz. i Lyesov., 1903; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5 (1904), No. 1, pp. 104–106*).—The author describes the results of 10 years' experiments in elaborating a method for artificially introducing into the living plant foreign bodies in desired quantity, which while not destroying the life of the plant may be of value in protecting it against parasites.

According to the author, the investigations described are based on the following facts: After the spring movement of the sap, when the pressure inside the vessels is greater than that of the atmosphere, there follows in summer and fall a period of negative pressure. If the vessels at this time are brought into communication with the liquid, the latter enters and fills them under the pressure of the outside air. For the successful introduction of liquids into the vessels of the tree it was found necessary to prevent the entrance of air. The author attributes the failure of many experiments in impregnating live trees with solutions to the disregarding of this fact.

In order to exclude the air the vessels are opened under a layer of liquid. For this purpose, if the trees do not exceed 3.5 in. in diameter, their trunks are surrounded by a feeding funnel of aluminum fastened to the tree by means of cement. For larger trees only portions of funnels are fastened to the trunk. After the funnel is fixed in place the solution is poured in and a cut made below the level of the liquid through the thickness of the bark and part of the sapwood. The liquid at once begins to be sucked in and to diffuse above and below the cut. A Mariotte vessel provides for the automatic replenishing of the liquid as it is absorbed.

The absorption of the liquid continues at the initial velocity for some time, after which it slackens, being influenced by climate, season of year, and state of the weather. The absorption takes place most rapidly in dry air at high temperatures and in strong sunlight. The absorption continues for about 5 days, and the immediate cause of its cessation seems to be the choking up of the vessels through which the liquid enters the tree. This is shown by the vigorous renewal of absorption through new cuts made in the tree. In an experiment on an oak tree 7 in. in diameter 11.37 gal. of liquid was absorbed by the tree in 53 hours.

Experiments with a number of solutions colored with eosin or methyl blue showed that liquids diffuse both upward and downward and also horizontally. The diffusion in a horizontal direction seems to be along the rays, as the heartwood does not become colored. The colored liquid has been traced to the smallest branches and also to the leaves, and in the case of experiments with grapevines into the berries themselves. The diffusion into the roots does not seem as uniform as through the sapwood of the trunk.

The author has not made much progress in finding substances which may be introduced in sufficient quantity to be destructive to parasites without being injurious to the plant, but expects interesting results from experiments with certain barium compounds with which he is experimenting.—P. FIREMAN.

A coral-spot disease of various trees and shrubs (*Jour. Bd. Agr.* [*London*], *11 (1904), No. 4, pp. 202, 203, pl. 1*).—A description is given of a disease which attacks

the stems and branches of a large number of fruit and forest trees, as well as various shrubs, being particularly troublesome on sycamore, elm, hazel, apple, pear, and currant bushes. The fungus causing the attack seems to be *Nectria cinnabarina*. The occurrence of the fungus may be noted by the bright coral-colored spots, and wherever observed the diseased branches should be removed and burned.

Report of the government botanist, Madras, C. A. Barber (*Dept. Agr., Madras Presidency, Rpt. 1902–3, pp. 8–10*).—A summary report is given of the investigations carried on by the botanist, particular attention having been devoted to the "spike" disease of sandalwood and the investigation of a serious pepper disease. So far no parasites are recognized as causing the disease of sandalwood, and the disease of pepper can not be definitely attributed to any one cause. Both of these troubles are to be the subject for further investigation.

Canker disease of trees (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 8, pp. 921, 922*).—A brief account is given of attacks of *Nectria cinnabarina* on a number of species of trees. The characteristic growth of the fungus is described, and it is suggested that for the prevention of the disease affected branches be cut out and all diseased branches, as well as dead trees and shrubs, be burned. If the disease appears in the nursery, all plants should be removed and burned. Where it occurs on large trees, all wounds made by cutting out the fungus from trunk, branches, or roots should be disinfected and coated with coal tar. As the fungus is able to develop on branches which have been cut from the tree, it is necessary to remove all such from about gardens, nurseries, etc.

A disease of privet (*Oklahoma Sta. Rpt. 1904, pp. 61, 62*).—A brief account is given of a fungus disease of privet which has caused considerable injury to hedges in the vicinity of the station. The fungus attacks the stems, destroying the bark and spreading over and around the stems, more or less girdling them.

When such diseased plants are observed, it is recommended that they be cut out and burned. If the hedge is badly damaged, it is believed best to remove it entirely, as such diseased hedges are a menace to healthy ones in the neighborhood. Spraying with Bordeaux mixture, especially in the spring about the time the buds are expanding, will aid in protecting against attacks of the fungus.

Thirteenth annual report of investigations for plant protection, 1903, P. Sorauer and L. Reh (*Arb. Deut. Landw. Gesell., 1904, No. 94, pp. XXXIII+250*).—Compiled notes are given of investigations by the authors and others regarding various insect and fungus diseases, the material being arranged according to the host plants.

The vegetative life of cereal rusts, J. Eriksson and G. Tischler (*K. Svenska Vetensk. Akad. Handl., 37 (1904), No. 6, pp. 1–19, pls. 3; abs. in Bot. Centbl., 95 (1904), No. 14, pp. 353–355*).—A defense is given of the mycoplasma theory regarding rust propagation (E. S. R., 14, p. 770). The authors describe their methods of investigation and cite *Pseudocommis vitis* and *Dendrophagus globosus* as analogous in some of their methods of growth. The various stages which they claim the mycoplasma passes through until it develops in form for spreading the rust are described.

Experiments with heterœcious rust fungi, W. Tranzschel (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), No. 3, p. 106; abs. in Bot. Centbl., 95 (1904), No. 9, p. 215*).—The author shows by means of experiments the association of *Æcidium leucospermum* with *Ochropsora sorbi*, of *Puccinia polygoni amphibii* with *Æ. sanguinolentum*, and *Æ. trientalis* with a Puccinia on *Carex limosa*, and also *Æ. coruscans* with the witch-broom fungus Chrysomyxa on *Ledum palustre*.

A contribution to the life history of Ustilago violacea, R. Baar (*Sitzber. Deut. Naturw. Med. Ver. Böhmen, n. ser., 23 (1903), pp. 276–282, figs. 6*).—The results of studies on *Ustilago violacea* or *U. antherarum*, as it is sometimes called, are given. This fungus is known to attack the anthers of many species of Dianthus, Silene, and

related genera, causing the destruction of the pollen. The mycelium which invades the anthers changes their contents to a violet-colored mass. The author has traced the mycelium through the various organs of the plant and shows that it is perennial in the rootstock of the host.

A brief review of Special Bulletins 24, 25, and 26, C. D. SMITH (*Michigan Sta. Bul. 216, pp. 7*).—This consists of a review of the following special bulletins of the station: Insect Enemies of Fruits in Michigan, by R. H. Pettit (E. S. R., 15, p. 1089); Fungus Diseases of Fruits in Michigan, by B. O. Longyear (E. S. R., 16, p. 67); and Spraying Calendar, by L. R. Taft (E. S. R., 16, p. 281).

Tieghemella japonica, K. SAITO (*Jour. Col. Sci., Imp. Univ. Tokyo, 19 (1904), Art. 19, pp. 8, pl. 1*).—A description is given of *Tieghemella japonica*, a new species of fungus recently found in a sake cellar in Japan. The morphology and physiology of the fungus, together with its technical characteristics, are described.

Some observations on the appearance of the oat nematode, K. HANSEN (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 279–302*).—The investigations of the author show that the oat nematode is widely distributed in Denmark and that great losses result from its attack. The reasons which lead the author to doubt the identity of the oat and the beet nematode (*Heterodera schachtii*) are given in the paper, and various remedies recommended for combating both nematodes are considered.

The following preventive treatments are suggested: A system of crop rotation in which oats, or mixtures of small grains containing oats, do not come oftener than every second, and preferably not oftener than every third or fourth year. As barley is also attacked by nematodes that undoubtedly are identical with the oat nematode, the safer plan is to exclude this crop also from the system of rotation, in the same way as oats, where there is danger of an attack of nematodes. Early sowing has been found of advantage in reducing the severity of an attack of nematodes, and the same holds true in regard to manuring, especially with nitrogenous fertilizers, which tend to render the crop more resistant toward the nematodes.—F. W. WOLL.

ENTOMOLOGY.

Insects, L. F. HENNEGUY (*Les insectes. Paris: Masson & Co., 1904, pp. 804, pls. 4, figs. 622*).—The present volume is intended as a general text-book on the subject of entomology and was prepared for the use of French entomologists partly for the reason that text-books on this subject in the French language were inadequate.

The book is essentially the author's class lectures collected by A. Lécaillon and G. Poirault and considerably elaborated for the present purpose. The subjects discussed in the volume include the general characteristics of insects, classification, anatomical peculiarities of the external skeleton, integument, digestive apparatus, circulatory system, respiratory organs, fat bodies, physiological functions of the muscular and nervous systems, reproductive organs, parthenogenesis, and methods of reproduction, embryology, larval development, metamorphosis of insects, and the origin of adult structures from embryonic tissues.

The literature relating to various subjects is briefly reviewed and a bibliography of 62 pages is included in the volume.

Nineteenth report of the State entomologist on injurious and other insects of the State of New York, E. P. FELT (*New York State Mus. Bul. 76, pp. 91–235, pls. 4*).—As in former reports by the State entomologist of New York, a general account is given of insect outbreaks during the year, office work, special investigations, publications, collections of insects, nursery inspection work, voluntary observers, etc. A synopsis is presented of a number of beneficial insects belonging to

the group Ophionini (pp. 97–125). A considerable number of species of these parasites are described with bibliographical reference notes on their habits, life history, and hosts.

Corythuca marmorata is reported as causing considerable damage to chrysanthemums during 1903. The insect is described in its various stages and notes are given on its life history. For controlling the pest clean culture and spraying with whale oil soap are recommended. During the year the author's attention was called to the damage caused by various species of plant lice, plum curculio, codling moth, pear psylla, San José scale, and other insects affecting fruits, garden vegetables, and shade trees. The author reports some success in the introduction of Chinese lady beetles.

In the control of San José scale a number of insecticides were tested. As a result of these experiments it is concluded that a mechanical mixture of crude petroleum containing 20 per cent of the oil is very effective. In early spring whale-oil soap is recommended. Kerosene emulsion was also found to be a valuable remedy. In experiments with lime-sulphur wash, during which 25 lbs. of lime and 20 lbs. of sulphur for each 240 gal. of water were used after boiling 15 minutes, the results were not as satisfactory as was hoped for. An investigation was also made of diseased and dying trees as affected by forest insects with especial reference to the relation between forest fires and injurious insects.

Report of the entomologist, C. French (*Jour. Dept. Agr. Victoria, 2 (1904), No. 9, pp. 854–859*).—During the year under report a number of experiments were carried out in treating various harmful insects such as San José scale, plant lice, etc. Brief notes are given on this work, and also on the inspection of orchards, nurseries, and gardens, the fumigation and treatment of old fruit cases, the inspection of imports and exports of fruit plants and grain, and miscellaneous injurious insects and birds.

Report of the State entomologist for 1903, S. Lampa (*Meddel. K. Landtbr. Styr. [Sweden], 1904, No. 97, pp. 64, figs. 5*).—During the year under report insect injuries were perhaps more extensive than in ordinary years. This is especially true of *Melolontha vulgaris* and *Cheimatobia boreata*. The latter species was exceedingly injurious to birch trees in various parts of Sweden, and notes are given on the habits, life history, and distribution of the pest. A number of remedies were used with considerable success. These included spraying with Paris green, the use of sticky bands, Raupenleim, etc. Good results were obtained from a combination of these methods. Brief notes are also given on *Psylla mali*, *Diloba cæruleocephala*, etc.

Report of the State entomologist, J. B. Smith (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 333–344*).—A copy is presented of the law of New Jersey regarding the introduction and spread of injurious insects. The author discusses the application and effects of this law, and gives a short account of the work of the entomologist during the year.

Report of the State entomologist, W. M. Schöyen (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1903, pt. 1, pp. 107–140, figs. 27*).—One of the most serious pests investigated during 1903 was *Aphelenchus fragariæ*, which caused great damage to strawberries in various parts of Norway. The attacks of these nematode worms caused abnormal growths in the leaf stalks of strawberries, with destruction of the roots and ultimate death of the plants. Notes are also presented, as in previous reports, on the more important insects observed during the year on cereals, grasses, legumes, potatoes, other garden vegetables, fruits, ornamental shrubs, and forest trees.

Report of the entomologist for the year ending August 31, 1903, C. S. Banks (*Ann. Rpt. Philippine Com., 1903, II, pp. 594–620, pls. 46*).—A brief account is given of the work of the entomologist during the year, with mention of the problems which present themselves for solution. The major portion of the report is occupied with an account of the insects of cacao already noted (E. S. R., 15, p. 1090).

Report of the entomologists, C. H. and H. T. Fernald (*Massachusetts Sta. Rpt. 1903, pp. 105–109*).—During the year under report the climatic conditions were generally unfavorable to the multiplication of insect pests. A few insects, however, were unusually numerous, particularly the apple-tree tent caterpillar, elm-leaf beetle, San José scale, plum curculio, and imported willow borer. *Neurotoma rufipes* was reported as causing great damage to plum trees in the Connecticut River Valley. The gypsy moth no longer occurs in such large colonies as formerly, but the insect is generally distributed, so that it appears to be impossible to exterminate it.

Entomological department, W. R. Shaw (*Oklahoma Sta. Rpt. 1904, pp. 57–61*).—Brief notes on the best methods of combating Hessian fly, garden webworm, and *Pyrausta rantalis*.

The apple-tree tent caterpillar and its life history, N. F. Davis (*Pennsylvania State Dept. Agr. Bul. 120, pp. 15, pls. 28*).—Brief notes are given on the appearance, habits, life history, and distribution of this insect. In 1903 a large percentage of the caterpillars in Pennsylvania, New York, and New Jersey were destroyed by a bacterial or fungus disease. Notes are also given on other natural enemies of the pest. The usual remedies in controlling this insect are recommended.

Report of the habits of the kelep, or Guatemalan cotton-boll-weevil ant, O. F. Cook (*U. S. Dept. Agr., Bureau of Entomology Bul. 49, pp. 15*).—About 4,000 of these ants in 89 colonies were introduced from Guatemala and appeared to endure the journey very successfully.

A detailed account is presented of the habits and biological relations of the ants. Several of the colonies were found with 2, 3, or more queens. The ant appears to be truly predaceous in habits, and no fear is entertained of its becoming a menace to cotton or other cultivated plants. The ant will attack and destroy the adult boll weevil and exhibits habits which make the author hopeful of its successful colonization in Texas. It still remains doubtful, however, "whether the keleps will survive the winter climate of Texas and whether they can be obtained or propagated in sufficient numbers to serve the practical purpose for which they have been introduced." It is urged that cultural methods of control be still maintained.

The Mexican cotton-boll weevil, E. M. Wilcox (*Alabama College Sta. Bul. 129, pp. 91–104, figs. 4*).—A review is presented of the introduction, history, and present distribution of the cotton-boll weevil within the United States. A copy is given of an Alabama law for preventing the importation of seed from cotton affected with the boll weevil. Notes are given on the habits and life history of this pest. While a number of natural enemies have been mentioned as likely to assist in the control of this pest, the author believes that improved methods of cultivation are the only effective means of controlling the boll weevil so as to raise profitable crops.

Insects injurious to the basket willow, F. H. Chittenden (*U. S. Dept. Agr., Bureau of Forestry Bul. 46, pp. 63–80, figs. 17*).—The author presents an account of the habits, life history, natural enemies, and means of combating imported willow curculio, poplar girdler, bronze birch borer, various species of sawflies, leaf beetles, leaf-eating caterpillars, and plant lice injurious to the basket willow and other species of willows. In combating these pests good results are usually had from complete inundation, and willow plantations on ground which can not be inundated suffer more extensively from insect injuries. Leaf-feeding species of insects may be destroyed by spraying with arsenate of lead, Paris green, or by the jarring method.

The codling moth, C. Mayer (*Agr. Jour. Cape Good Hope, 25 (1904), No. 2, pp. 153–157, figs. 7*).—The condition of infestation with this insect pest is briefly noted and directions are given for applying a most effective preventive remedy for controlling it. The remedies recommended are spraying with Paris green, banding the trees, and destroying windfalls. Brief notes are given on the results obtained from the application of these remedies.

Experimental work with the peach aphis, W. W. FROGGATT (*Agr. Gaz. New South Wales, 15 (1904), No. 7, pp. 603–612*).—The occurrence and life history of *Aphis persicæ-niger* are described in some detail. Infested peach trees were sprayed with lime-sulphur-salt wash containing 30 lbs. lime, 20 lbs. sulphur, and 15 lbs. of salt per 60 gal. of water. It is recommended that this wash be applied to peach trees in New South Wales during the month of July. The cold weather of winter apparently has no effect in checking the propagation of this pest. A number of parasitic insects were observed preying upon the peach aphis, and detailed descriptive notes are presented on these species.

The army worm in Australia, W. W. FROGGATT (*Agr. Gaz. New South Wales, 15 (1904), No. 4, pp. 327–331, figs. 2*).—During the season of 1903–4 the long-continued Australian drought was broken by a period of abundant rainfall. Vegetation grew very luxuriantly and the large numbers of army worms which appeared showed that the eggs of this species were capable of resisting excessive drought and unfavorable conditions. The approved methods of controlling this pest are described and recommended.

Report on Tortrix pilleriana, P. MARCHAL (*Bul. Mens. Off. Renseignements Agr , 3 (1904), Feb., pp. 177–196*).—This insect is considered the most serious pest of grapes in France. It develops one generation per year. A detailed account is given of 3 general methods of procedure against the pest. The most effective method consists in spraying the grape vines with water at a boiling temperature. Similar treatment with superheated steam and spraying with various insecticides also proved fairly satisfactory. The moths may be captured by means of lantern traps. The author recommends the application of boiling water to grape vines during the period of hibernation of the pests.

The strawberry weevil, F. SHERMAN, Jr., and R. W. COLLETT (*North Carolina Dept. Agr., Ent. Circ. 12, pp. 8*).—An account is given of the damage inflicted by this pest on the strawberry industry, together with notes on the appearance, life history, and habits of the insect. It was found by an examination of infested strawberry fields that for a period of 2 weeks after the last picking of the season the insect could be found in an adult, pupal, and larval condition. During this time, therefore, it is possible to attack the pest most advantageously. A large number of remedies was tried for this purpose.

During the experiments reported by the authors air-slaked lime, Bordeaux mixture and Paris green, carbolic acid and water, whale-oil soap in water, spirittine, and other insecticides were sprayed upon infested strawberry plants. As a result of these experiments it is believed that little hope can be entertained of any material benefit from spraying. The best results will probably be secured through the planting of varieties with imperfect blossoms, the prompt mowing and burning of fields, the destruction of rubbish along the edges of strawberry fields, and clean culture, together with spraying with Bordeaux mixture and Paris green. The last-named remedy is recommended not on account of its effect upon the weevil, which is very slight, but because it has a beneficial effect in destroying leaf beetles and controlling leaf rust.

How to know butterflies, J. H. COMSTOCK and ANNA B. COMSTOCK (*New York: D. Appleton & Co., 1904, pp. XII+311, pls. 45, figs. 49*).—The authors have noted in their class work in entomological courses that comparatively few persons are acquainted with the names and habits of the common butterflies. This fact is attributed to the lack of suitable aids for beginners in this study.

The present volume, therefore, is prepared for the purpose of furnishing brief descriptions of species of butterflies with the best possible illustrations, and with notes also on the more important facts in the life history of different species. A general account is given of the relation of butterflies to other insects, the structure, metamorphosis, and life history of butterflies. Each species included in the volume

is described in its various stages. An analytical table is given for the identification of species. As a rule, only those species are admitted which belong to the eastern United States.

A preliminary catalogue of the described species of the family Fulgoridæ of North America north of Mexico, O. H. SWEZEY (*Ohio Dept. Agr., Div. Nursery and Orchard Inspection Bul. 3, pp. 48*).—In this catalogue an attempt has been made to include all species of the family which have been reported in literature accessible to the author. Notes are given on the distribution and synonymy of each species.

Results of a biological study of South American white ants, F. SILVESTRI (*Mem. by Rev. Soc. Cient. "Antonio Alzate," 18 (1903), No. 7-8, pp. 353-378*).—The various kinds of individuals observed in colonies of white ants with notes on the nesting habits and other matters relating to the biology of different species of these insects.

The introduction of the fruit-fly parasite, G. COMPERE (*Jour. Dept. Agr. West. Australia, 10 (1904), No. 2, pp. 68-72*).—The author made a trip to Brazil for the purpose of seeking insect parasites of *Ceratitis capitata*. During this journey notes were made on the prevalence and injurious effects of the fruit fly. A species of beetle was obtained belonging to the family Staphylinidæ which attacks the fruit fly and considerable success was had in transmitting these predaceous insects to England. The beetle attacks the fruit flies only in the maggot condition, but appeared to destroy a large percentage of these pests in Brazil.

Notes on Ixodidæ, L. G. NEUMANN (*Arch. Parasit., 8 (1904), No. 3, pp. 444-464, figs. 2*).—The genera of this family are carefully diagnosed and detailed descriptions are given of the various species, together with notes on their habits and life history.

Life history of Lycæna argiades, F. W. FROHAWK (*Entomologist, 37 (1904), No. 497, pp. 245-249*).—A description is given of the egg, various larval stages, and pupa of this butterfly, with other notes on its habits and life history.

When to spray, A. E. STENE (*Rhode Island Sta. Bul. 100, pp. 121-148, pls. 3, figs. 3*).—In this bulletin the author's purpose was to present a general account of the subject of spraying, together with a tabular statement of the periods when spraying is most effective for various insect and fungus diseases, formulas for the preparation of fungicides and insecticides, and specific directions for the control of the San José scale.

A new general insecticide, H. M. LEFROY (*Jour. British Honduras Soc. Agr. and Com., 1 (1903), No. 1, p. 16*).—The author describes an insecticide having the following formula: 10 lbs. whale-oil soap, 5½ pts. crude Barbados oil, 4 oz. Naphthalene. This emulsion is effective against plant lice, mealy bugs, scale insects, ticks, and other pests on domesticated animals.

The method of applying Paris green, W. B. SEABROOK (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 7, pp. 159, 160*).—The author states that Paris green may be applied to cotton in a dry, unmixed form by placing a small quantity of it in a bag composed of material known as American gray sheeting. The bag is attached to a staff and is gently rapped with a stick while in position over the cotton plant. No injury was caused to the cotton by this method of application.

Mosquitoes in Hawaii, D. L. VAN DINE (*Hawaii Sta. Bul. 6, pp. 30, figs. 12*).—Mosquitoes were not known in Hawaii previous to 1826, at which date *Culex pipiens* was introduced. Within recent years two other species, *Stegomyia fasciata* and *S. scutellaris*, have also been introduced. The most abundant species is *Culex pipiens*. Notes are given on the habits, life history, and breeding places of all three species. A number of fish are known to feed upon the larval mosquitoes, goldfish being considered the most important enemy of the mosquitoes. While it is believed that complete extermination of mosquitoes is impossible, it is urged that strong efforts be made to reduce them as far as possible by drainage of pools and the use of kerosene.

Annual report of the bee keepers' association of the Province of Ontario for 1903 (*Toronto: Ontario Dept. Agr., 1904, pp. 64*).—The work and prospects of the association and the outlook for honey production are briefly outlined in the president's address by A. W. Chrysler (pp. 5, 6). B. O. Lott gave an account of the advantages of out-apiaries (pp. 6–8). It was stated that bees could be shipped for considerable distances to obtain the linden and clover in the spring, buckwheat later, and then back home for winter quarters. With good railway facilities or with good wagon roads it is considered an easy matter to move an apiary 50 or 60 miles without any loss.

A report of the honey exchange committee was submitted by H. G. Sibbald (pp. 20, 21). A decision was reached that honey be sold through a reliable wholesale house and that the members be advised as to the probable prices. M. Pettit discussed forced or shaken swarms (pp. 32–35). A general account of the methods of swarming was given, with notes on the effects of these methods upon honey production under different conditions. For the production of comb honey the speaker recommended that bees be allowed to swarm naturally.

J. Fixter gave an account of bee-keeping experiments at the Dominion Farm apiary (pp. 37–39). This paper has been previously abstracted from another source (E. S. R., 16, p. 275). Among the other papers read at the association, mention may be made of the report of the committee to amend the by-laws of the association by B. O. Lott, chemical work in connection with bee keeping by F. T. Shutt, report of the inspector of apiaries by W. McEvoy, and a historical address on bee keeping by C. C. James.

Bee keeping for beginners, W. CHITTY (*London: Kegan Paul, Trench, Trübner & Co., 1903, pp. VIII+87, figs. 37*).—This volume was prepared for use in schools in accordance with the syllabus of the Board of Education. It contains an account of the economic importance of bees, their life history, modern appliances for apiaries, management of bees, preparation of honey for the market, and the control of bee diseases.

Notes on the silk of spiders (*Agr. Prat. Pays Chauds, 4 (1904), No. 19, pp. 119–121, figs. 3*).—Brief notes are given on the quality of silk spun by various species of spiders and on the mechanical conditions of this fiber.

Report of inspectors on raising silkworms in 1903, L. GODINOT ET AL. (*Ann. Soc. Agr., Sci. et Ind. Lyon, 8. ser., 1 (1903), pp. 161–167*).—Brief notes on the condition of sericulture as observed in the Département du Rhône.

Sericulture in Italy and means of extending the industry in our southern regions, E. VERSON (*Bol. Uffic. Min. Agr., Ind. e Com. [Rome], 5 (1904), No. 3–4, pp. 282–291*).—Notes are given on the conditions which prevail in southern Italy with reference to the possibility of encouraging the raising of silkworms. It is suggested that government experts be detailed to give instruction and other assistance in improving this industry.

FOODS—NUTRITION.

Suggestions to importers of food products, H. W. WILEY (*U. S. Dept. Agr., Bureau of Chemistry Circ. 18, pp. 16*).—In order to facilitate the execution of the law regarding the inspection of imported food products, the attention of importers is called to a number of suggestions. In the absence of contrary judicial interpretation a food product will be deemed adulterated—

"(1) If any valuable ingredient naturally present therein has been extracted.

"(2) If a less valuable ingredient has been substituted therefor.

"(3) If it be colored, powdered, or polished, with intent to deceive, or to make the article appear of a better quality than it really is.

"(4) If it be a substitute for or imitation of a genuine article and offered under the name of that article.

"Products will be deemed injurious to health in the absence of contrary judicial determination—

"(1) If any substance, with the exception of the long-used, well-known condimental substances, viz, common salt, spices, sugar (sucrose or saccharose), wood smoke, and vinegar, be added thereto for preserving, coloring, or other purposes, which is injurious to health, either as determined by actual experimental evidence or in the predominating opinion of health officers, hygienists, and physiological chemists.

"(2) If the products be decomposed, filthy, decayed, or in any unfit condition for human consumption.

"Products will be considered by the Department as misbranded in the absence of contrary judicial determination—

"(1) If any false name or property be assigned thereto in the label, directly or by implication.

"(2) If any false statement be contained in the label relating to the place of manufacture or production of the contents of the package, directly or by implication.

"(3) If they are not of the nature, substance, and quality commonly associated with the name under which they are sold or offered for sale.

"Food products will also be excluded from entry into the United States if they are of a character or kind forbidden entry in the country where they are manufactured or from which they are exported."

"Food products will also be excluded from the United States if they are forbidden to be sold or are restricted in sale in the countries in which they are manufactured or from which they are exported.

The official standards, which have been noted from another publication (E. S. R., 15, p. 702), are quoted.

Officials charged with the enforcement of food laws in the United States and Canada, W. D. BIGELOW (*U. S. Dept. Agr., Bureau of Chemistry Circ. 16, pp. 25*).—The United States laws relating to food supply are enforced by the Department of Agriculture and the Treasury Department. Lists are given of the officials who have this in charge, as well as some data regarding the organization of the work. Similar information for the individual States and Territories having pure-food laws and lists of the officials and chemists directly concerned with the carrying out of the provisions of such laws are also given.

Food of Europeans and native laborers in the Tropics, G. REYNAUD (*Compt. Rend. 13. Cong. Internat. Hyg. et Démogr., Bruxelles, 1903; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, pp. 85–88*).—The author studied rations of Annamites, Chinese, Abyssinians, and others. According to his calculations the requirements for maintenance in tropical and subtropical countries are, per kilogram body weight, 1.25 gm. protein, 0.75 gm. fat, 3.55 gm. carbohydrates, 0.50 gm. alcohol, and 30 calories of energy during the hot season. During the colder season the protein and energy requirements are somewhat greater, the alcohol requirements the same, and the carbohydrates somewhat less.

He also gives values for the food requirements when work is performed. In tropical and subtropical countries the values for moderate work suggested per kilogram body weight are 1.50 gm. protein, 0.75 gm. fat, 0.50 gm. alcohol, 4.30 gm. carbohydrates, and 36 calories of energy. For severe work the protein was given as 1.75 gm., the carbohydrates as 4.98 gm., and the energy as 40 calories, the other factors being the same as before. Similar calculations are given for the colder season. It is stated that the rations of the French troops in the Sudan furnished per man 159 gm. protein, 37 gm. fat, and 547 gm. carbohydrates.

The author discusses the subject of foods, beverages, and condiments suited to the Tropics at considerable length. In his opinion, less protein and fat are required than in colder countries, and carbohydrates should be considered as the principal source of energy in the diet.

Practical dietetics with reference to diet in disease, Alida F. Pattee (*New York: Author, 1904, 2. ed., pp. XVI+311, figs. 3*).—The author states that in the preparation of this edition the original material has been thoroughly revised and additions made. The volume contains discussions of food; food values and classification; nourishment in acute diseases; general rules for feeding the sick; liquid, semiliquid, and solid food; diet in disease; diet in infancy, and related topics, the bulk of the volume being made up of receipts for the preparation of foods and drinks.

Food and diet of man in health and disease, A. Gautier (*L'alimentation et les régimes chez l'homme sain et chez les malades. Paris: Masson & Co., 1904, pp. XVI+524, figs. 8*).—This extended handbook and summary is divided into 3 parts. The first discusses such questions as the theories of nutrition, the functions of nutrients, energy value of food, production of work, and the body as a machine. In the second part the author considers at length the characteristics, composition, and nutritive value of meat, milk, eggs, cereals, vegetables, and other foods, condiments, and beverages, as well as the preparation of food and some related topics. The third part is devoted to discussions of diet in relation to disease.

The situation of gluten flour, A. S. Hoyt (*Dietet. and Hyg. Gaz., 20 (1904), No. 7, pp. 402, 403*).—In view of the fact that gluten flour often contains an excessive amount of starch and is not true to name, the author emphasizes the need of some standard as regards protein content, and points out that with 40 per cent protein present there is still sufficient starch for the growth of the yeast plant and the production of satisfactory bread.

The quantity of phosphorus contained in flour, Balland (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 5, pp. 332, 333*).—Since incineration of meal and flour results in a partial loss of phosphoric acid, the author estimated the amount of phosphorus present in the original material. The method is not described.

A grain of wheat: Its structure and properties, N. A. Cobb (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 3, pp. 165–170, figs. 3*).—The structure of the wheat kernel, the distribution of the different nutrients, and related topics are spoken of.

Canned fruit, preserves, and jellies, Maria Parloa (*U. S. Dept. Agr., Farmers' Bul. 203, pp. 32, figs. 5*).—The author has summarized available data on the household preparation of canned fruits, preserves, jellies, and similar products, embodying in her discussion the results of her own experiments and an extended study of the subject.

Among the topics treated of are the use of canned and preserved fruits in the home, preparation of preserved fruits for the market, principles of canning and preserving, sterilization, utensils needed for canning and preserving, and the selection of fruit. The directions for making the various sorts of preserves, jams, etc., are clear and concise, and are accompanied by discussions of the general processes involved and the principles on which they depend.

The seeds of Shorea robusta as a famine food, O. Reinherz (*Agr. Ledger, 1904, No. 5 (Veg. Prod. Ser., No. 81), pp. 33–36, map 1*).—Analytical data are reported and discussed. Some data are also given regarding the changes brought about when the seeds are cooked with water containing caustic soda in the proportion of 1 to 1,000.

Analyses of Indian pot herbs of the natural orders Amarantaceæ, Chenopodiaceæ, and Polygonaceæ, D. Hooper (*Agr. Ledger, 1904, No. 6 (Veg. Prod. Ser., No. 84), pp. 61–72*).—Analyses of 28 specimens are reported and data are given regarding their botanical characteristics, distribution, and the extent to which they are used as food. According to the author, the analytical data show that weight for

weight (on the dry matter basis) the cooked vegetable is equally as nutritious, if not more so, than the uncooked vegetable, the albuminoids being very similar in the 2 cases, and the phosphoric acid being only slightly reduced in amount.

"It would seem that the sugar of the soluble carbohydrates and a certain amount of saline matter are removed by the operations of boiling and straining, and the balance of the albuminoids is maintained by the major portion coagulating and remaining behind with the other insoluble constituents."

A preliminary study of the digestibility of connective tissue mucoids in pepsin-hydrochloric acid, E. R. Posner and W. J. Gies (*Amer. Jour. Physiol., 11 (1904), No. 3, pp. 330–350*).—Some of the conclusions drawn from these investigations were in effect as follows:

Connective tissue mucoids are digestible in pepsin-hydrochloric acid. The digestive process is relatively slow and gradual, however, and considerable substance remains insoluble even under the most favorable zymolytic conditions, the amount being in every case at least 10 per cent of the original mucoid. The soluble products are albuminate, primary mucoproteoses, secondary mucoproteoses, and mucopeptones. The general properties of these bodies are identical with those of typical peptic products.

The indigestible matter appears to consist mainly, if not wholly, of resistant compounds of proteid and glucothionic acid. In most cases the mucoproteoses were also found to be glucothionic acid products of varying composition. A glucothionic acid similar to chrondroitin sulphuric acid was separated from both the indigestible matter and the proteoses. The peptones did not contain the glucothionic acid radical. At least 25 per cent of the indigestible matter consisted of combined glucothionic acid.

Connective tissue mucoids are readily digested by trypsin in alkaline solution. Tryptophan, leucin, and tyrosin are produced from them in abundance.

Food analyses, C. F. Juritz (*Rpt. Senior Analyst, Cape Good Hope, 1903, pp. 9–44*).—Data are reported of a number of examinations and analyses of foods, beverages, condiments, drugs, and potable waters. The bulk of the analytical work was carried out under the local pure-food laws.

Dairy and food division, C. B. Witmer (*Pennsylvania State Dept. Agr. Bul. 118, pp. 62*).—This bulletin includes the laws creating the office of dairy and food commissioner in Pennsylvania and a digest of the laws committed to the commissioner's administration.

Aromatics and nervines in alimentation, A. Valenti (*Aromatici e nervini nell' alimentazione. Milan: Ulrico Hoepli, 1904, pp. 354; rev. in British Med. Jour., 1904, No. 2268, p. 1433*).—Under "aromatics" the author discusses salt, vinegar, sugar, pepper, ginger, and other condiments, giving in each case a brief account of the source, method of preparation, character, and physiological effect. Under "nervines," alcohol, coffee, tea, cocoa and similar products, and tobacco are included.

Studies in body temperature. I, Influence of the inversion of the daily routine; the temperature of night workers, F. G. Benedict (*Amer. Jour. Physiol., 11 (1904), No. 2, pp. 145–169, figs. 5*).—Using a very delicate thermometer, described in a previous publication (E. S. R., 13, p. 878), the author studied fluctuations in body temperature when the daily routine was inverted. "No tendency to an inversion of the temperature-curve by inverting the daily routine of life is observed in any of the experiments reported here."

The calcium content of the feces of nursing infants, J. Korjev (*Inaug. Diss., St. Petersburg, 1903; abs. in Russk. Vrach., 1903, p. 1038; Jour. Physiol. et Path. Gén., 6 (1904), No. 3, pp. 541, 542*).—In this study mother's milk and cow's milk were compared.

The importance of examining the feces, J. STRASBURGER (*Berlin. Klinik, 1904, No. 190, pp. 1-20; abs. in British Med. Jour., 1904, No. 2277, Epit., p. 25*).—In a discussion of the importance of examining feces from a clinical standpoint a number of experimental and analytical methods are described.

The effect of diuretics on the urine, with a diet poor in salts, H. D. HASKINS (*Amer. Jour. Physiol., 10 (1904), No. 6, pp. 362, 363*).—The diuretics tested in experiments with a healthy young man did not increase the renal excretion of sodium chlorid even when the water and urea excretion was increased.

ANIMAL PRODUCTION.

Analyses of concentrated commercial feeding stuffs, W. FREAR (*Pennsylvania State Dept. Agr. Bul. 122, pp. 52*).—During the year 1903 the State department of agriculture examined 242 samples of cattle feeds in compliance with the provisions of the State law, including cotton-seed meal and feed, linseed meal, buckwheat middlings; wheat bran, middlings, and feed; rye chops, feed, and gluten meal; barley chops and feed, and malt sprouts; oat feeds; corn milling products, bran, gluten feeds, hominy meal, and other corn products; mixed feeds with named components, proprietary feeds with the components not named, condimental feeds, and similar goods.

In addition to chemical analyses the author states that the samples were all examined with the microscope as a means of judging of the specific nature of mixed feeds and the freedom of various samples from adulterants.

"Briefly reviewed, the year's examination has not shown new types of adulteration; but the practice of adding foreign products to feeds sold as mixtures of named grains and of selling without guaranty feeds made in whole or in part from by-products still appears very general. Respecting the use of commercial feeds, a final word may not be out of place. For horses and cattle not upon the farm, a great variety of feeds may be used. The farmer, on the other hand, is usually able to grow his fibrous and starchy foods more cheaply than he can purchase them. His need is rather an increased supply of protein with which to supplement and balance up his foods of home production. For this purpose the food purchased must be richer, much richer usually, than corn, which has an average content of 10.3 per cent of protein and 5 per cent of fat."

Concentrated feeding stuffs, J. P. STREET, W. P. ALLEN, and V. J. CARBERRY (*New Jersey Stas. Bul. 175, pp. 68*).—In accordance with the provisions of the State feeding-stuff law, analyses are reported of cotton-seed meal, linseed meal, gluten meal and feed, hominy meal, corn bran, and similar products; distillery and brewery by-products including, among others, dried distillers' grains, dried brewers' grains, and malt sprouts; molasses feeds; mixed and proprietary feeds; dried beet pulp; ground meat; poultry feeds; barley feed, wheat bran and middlings; ground wheat, rye, and oats; buckwheat middlings, bran, and feed; oat middlings, corn meal, and ground mixed grains.

According to the authors—

"Of the 150 different brands of feed received, and which should have been guaranteed, 6 failed to meet this requirement.

"Consumers are urged to purchase no unguaranteed material, except mill products like bran, middlings, and corn meal, for which no guarantee is required.

"Of the 275 samples which are guaranteed, 125 are deficient, 92 of these being low in protein.

"Of the 122 samples which did not require a guarantee, 91 were of normal composition, 23 were variable, and 8 were adulterated.

"In buying feeds to supplement his home-grown supply, the dairyman's aim should be to secure digestible and palatable protein on the most economical terms. A very large proportion of the different brands examined do not meet this requirement. The study of the guarantees and the composition of the various feeds . . . is therefore of great value.

"The quality of the manure made depends to a great extent on the kinds of feeds used, and a judicious selection will result in a great improvement in this direction."

The feeding value of the residue obtained in the manufacture of alcohol from maize, C. MONTANARI (*Staz. Sper. Agr. Ital., 36 (1903), No. 8–9, pp. 751–755*).—Analytical data are reported and discussed.

Disembittering lupines with limewater, P. SOLTSIEN (*Chem. Ztg., 28 (1904), No. 76, p. 889*).—A note on the effect of temperature on the results obtained in disembittering lupines with limewater. Better results were obtained with warm than with cold water. The author also speaks of the use of magnesia water for this purpose.

Digestion experiments with sheep, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1903, pp. 63–79*).—Digestion experiments with sheep are reported, each covering 14 days, of which the first 7 were regarded as preliminary. The various feeding stuffs were fed with meadow hay, the digestibility of the special materials being calculated in the usual way. A summary of the work follows:

Coefficients of digestibility of feeding stuffs—Experiments with sheep.

Ration.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Hay, largely Kentucky blue grass, average 3 sheep	63.84	62.53	53.74	66.08	66.62	44.73
Apple pomace, average 3 sheep	72.51	....	47.22	84.48	61.57	54.74
Biles distillers' grains, average 3 sheep	73.01	70.59	95.39	70.43	77.24	....
Merchants distillers' grains, average 3 sheep	79.12	71.68	96.51	80.09	88.83	....
Dried brewers' grains, average 3 sheep	61.40	82.33	88.24	55.74	46.83	....
Malt sprouts, 1 sheep	78.01	76.39	60.31	77.78	102.50	....
Soy-bean meal, average 2 sheep	91.39	91.07	93.51	91.17	140.03	43.32
Hominy meal, 1 sheep	90.80	74.03	88.95	94.18	126.55	34.67

Among the conclusions drawn from these tests were the following: "The [apple] pomace contained fully as much digestible matter as silage made from the smaller varieties of corn. Whether, per unit of dry matter, it is as valuable a feed as corn silage is rather uncertain. This point will be ascertained later. . . .

"The fiber [of dried distillers' grains] showed marked variations in digestibility, in common with all feeds of similar character. While it has been generally held that nitrogenous feed stuffs do not affect the normal digestibility of the coarse fodders they supplement, it certainly seems reasonable to conclude that the addition of 200 to 250 gm. of the distillers' grains to the hay ration, giving a nutritive ratio of 1:4, has resulted in increasing the digestibility of the fiber in hay; which accounts, in the majority of cases, for the apparently very high digestion coefficients obtained. Admitting this to be the case, the fact still remains that, while the digestion coefficient for the fiber is rather of an uncertain quantity, it must be regarded as relatively high. . . .

"Attention is called to the fact that the higher the digestion coefficients obtained for the fiber, the higher are those obtained for the extract. This is undoubtedly due to the intimate chemical and physiological relations known to exist between these two fodder groups. . . .

"It is evident, from all trials thus far made, that the protein and fat [of soy-bean meal], comprising from 50 to 60 per cent of the bean, is very fully digested.

Whether the high digestibility of the fiber and extract in the present experiment is due to the variety of the bean, or is a peculiarity of the sheep employed, will be determined by further tests. . . .

"The addition to the hay of even a carbohydrate feed, such as hominy, seemed to have increased the digestibility of the fiber in the hay, judging from the coefficients obtained for the hominy fiber."

The origin of the hippuric acid produced by herbivora, T. PFEIFFER, R. RIECKE, and C. BLOCH (*Mitt. Landw. Inst. K. Univ. Breslau, 2 (1904), No. 4, pp. 695–728*).—From a large number of experiments with sheep general conclusions were drawn, including among others the following: The addition of easily digested carbohydrates to a ration producing a large amount of hippuric acid diminished its production somewhat. Increasing the amount of digestible proteid consumed slightly increased the excretion of hippuric acid. No relation was found between the putrefactive fermentation of proteid and the production of hippuric acid.

Aleuronat and ground beans were concerned in the formation of hippuric acid not alone on account of their high protein content, but because they must contain the mother substance of this acid. Increasing the alkalinity of the urine by giving sodium acetate had no influence upon the excretion of hippuric acid. Clover hay, which is considered as a fair representative of the leguminosæ, contains only a small amount of the hippuric acid mother substance, and that present is in a very indigestible form.

Contrary results were noted with meadow hay. The greater part of the hippuric acid yielding substance in meadow hay is soluble in hot water. Arabinose, selected as a representative of the pentosans, had no effect on the formation of hippuric acid, but coniferin, a representative aromatic constituent, exerted an influence. The crude fiber of the different feeding stuffs contained a part of the hippuric acid producing substance and in this respect marked differences were noted between clover hay and meadow hay. In the case of the former the digestible crude fiber was principally concerned in the hippuric acid formation, while with the latter this was not the case.

Raising dairy calves without milk, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1903, pp. 80–86*).—A homemade mixture of wheat flour, cocoanut meal, nutrium, linseed meal, and blood meal, recommended by Hayward of the Pennsylvania Station (E. S. R., 14, p. 479), was compared with Blatchford's calf meal as a feeding stuff for calves. In general the meals tested were gradually substituted for milk.

Two calves fed the homemade mixture weighed, respectively, 310 and 260 lbs. at the close of the trial, having gained 1.4 and 1.1 lbs. per day. The first of these calves was 6 months old and the other 5½ months old, and they were receiving 3 lbs. and 2 lbs. of the meal daily at the close of the test. Another calf was fed the commercial feeding stuff under much the same conditions. When 4½ months old it weighed 251 lbs. During the last 42 days of the test no feed was eaten except the calf meal, the average daily gain during this period being 1.15 lbs.

The author's principal conclusions were in effect as follows: The commercial calf meal is hardly as satisfactory as the Hayward mixture during the first 3 months of the calf's life, and it will probably prove necessary to feed one-third skim or whole milk and two-thirds meal during this period. Mixed with hot water 1:6 and fed at first with skim milk, it proved quite satisfactory in the present single trial. It is possible that delicate calves would not thrive as well upon the meal as the one in the present trial. The commercial calf meal was in good mechanical condition and can not be considered especially expensive.

A comparative test in feeding calves, H. P. SUTER (*Agr. Gaz. New South Wales, 15 (1904), No. 5, pp. 489–491*).—Four calves, fed a ration of cod-liver oil and skim milk in the proportion of 2 oz. to 3 gal., gained 1.42 lbs. per day at a cost of 2.88 cts. per pound during the 6 weeks covered by the test, as compared with a gain of 0.94 lb. per day at a cost of 4.06 cts. per pound on a ration of copra cake or cocoanut-oil cake soaked in water and boiled with pollard, molasses, and water for half an hour

and then mixed with skim milk, the proportions fed per day being 4 oz. copra cake, 8 oz. pollard, 2 oz. molasses, and 3 gal. skim milk.

The cod-liver oil ration "is easily fed, and entails little labor in its preparation and mixing. The calves relished the food and appeared in better condition at the end of the test." The copra-cake ration "requires more attention to prepare, and the calves did not thrive so well. The evidence is distinctly in favor of the cod-liver oil ration, both in the cost of ration and in the increase in weight, as well as in the time employed in preparing and feeding the ration."

Eggs as a feeding stuff for calves, Rarkin (*Jour. Soc. Agr. Suisse Romande, 44 (1903), No. 10, pp. 252–257*).—A summary of data which, in the author's opinion, indicate that eggs are very valuable for supplementing skim milk in calf feeding. In one of the tests a calf weighing 60 kg. was fed 24 days, on an average, a ration of 14 liters of skim milk with 6 eggs. The average daily gain was 1.55 kg. per day.

Stock feeding experiments (*Oklahoma Sta. Rpt. 1904, pp. 41–46*).—Using lots of 5 steers each, different combinations of cotton seed, Kafir-corn meal, shelled corn, corn meal, alfalfa hay, prairie grass hay, and wheat straw were tested for 140 days. Before the close of the test 2 of the animals in one of the lots were removed on account of sickness or injury. The gains in weight ranged from 1.14 lbs. per head per day on cotton-seed meal and wheat straw to 2.34 lbs. on cotton seed, Kafir-corn meal, alfalfa hay, and wheat straw. In every case the amounts of feed consumed were recorded. When the steers were sold and slaughtered, the dressed weight ranged from 56.7 per cent of the live weight in the case of the lot fed cotton-seed meal, shelled corn, prairie-grass hay, and wheat straw, to 59.2 per cent in the case of the lot fed corn meal and alfalfa hay.

Three pigs followed each lot of steers. All of them made very small gains except those following the lot fed cotton-seed meal, shelled corn, prairie-grass hay, and wheat straw. This lot made fair gains. During the latter part of the test, to insure satisfactory gains, all the pigs were fed a liberal allowance of corn meal in addition to the feed which they could gather. The total increase in weight ranged from 332 lbs. with the lot following the steers fed cotton seed, alfalfa hay, and wheat straw to 531 lbs. with the lot following the steers fed shelled corn mentioned above. Considering both the steers and pigs, the greatest profit, $29.19, was obtained on the ration of cotton seed, Kafir-corn meal, alfalfa hay, and wheat straw.

Feeding and grazing experiments with beef cattle, J. F. Duggar (*Alabama College Sta. Bul. 128, pp. 51–88, figs. 4*).—Various problems connected with the profitable feeding of cattle under local conditions were studied. In a test made with 4 lots of 5 steers each, covering 84 days, cotton seed was compared with cotton-seed meal, and sorghum hay with a mixture of sorghum hay and cowpea hay and with shredded corn stover.

The steers in lot 1, fed cotton-seed meal and corn chop 2:1 with sorghum hay, made an average daily gain of 2.23 lbs. per head, requiring 4.82 lbs. of grain and 6.56 lbs. of coarse fodder per pound of gain. The steers in lot 3, feed cotton seed and corn chop 3:1 with sorghum hay, made an average daily gain of 1.19 lbs. per head and required 8.12 lbs. of grain and 11.09 lbs. of coarse fodder per pound of gain. On a ration of cotton seed and corn chop 3:1 with sorghum hay and cowpea vine hay in equal parts, the steers in lot 2 made an average daily gain of 1.93 lbs. per head, requiring 5.41 lbs. grain and 6.85 lbs. coarse fodder per pound of gain.

On the same grain ration but with shredded corn stover, the average daily gain of the steers in lot 4 was 0.98 lb. per head, the grain required per pound of gain being 9.41 lbs. and the coarse fodder 10.23 lbs. The financial returns are discussed on the basis of high, medium, and low values for the different feeding stuffs. "Whatever the price of feed the ration of mixed cowpea and sorghum hay, cotton seed, and corn chop was the most profitable.

"The profit in feeding beef cattle is made, not by producing new growth at less cost per pound than it sells for, but in the increased value of the original weight, due to fattening. A margin of 1 cent per pound between purchase price and selling price is desirable.

"About 7 lbs. of raw cotton seed was fed in the daily ration without injury to the health of the average steer."

Some data are given regarding the cost of raising cattle under different conditions. Three grade steers, when 2 years old, fed on skim milk, grain, hay, and pasturage, weighed, on an average, 867 lbs., the cost of a pound of gain being 2.12 cts. On rye pasture alone yearling steers gained 1.67 lbs. per head daily. Grade calves on pasture alone gained 0.72 lb. per head daily and yearling steers 1.43 lbs. During the pasturage season of 7 months the average gains in live weight of cattle of different ages on unimproved sandy pasture ranged from 8 per cent with mature cows nursing calves to 51 per cent with sucking calves. The author points out that "on the winter range cattle of all ages became very thin, and, in the opinion of the writer, it would have been highly profitable . . . to have supplied them with hay and other food during the winter."

Rice meal and corn meal, fed with hay and skim milk, were compared with 2 lots of 2 calves each, the experimental period covering 91 days. The average daily gain on the rice-meal ration was 1.6 lbs. per head and on the corn-meal ration 1.9 lbs. Considerable more feed was required per pound of gain with the rice-meal than with the corn-meal ration. In the author's opinion "rice meal proved decidedly inferior to corn meal."

When inferior shredded corn stover was fed to calves 37 per cent was refused. When a shredded corn stover of good quality was fed freely to steers 44 per cent was rejected. The waste when slightly moldy coarse sorghum hay was fed to steers averaged 20 per cent.

Methods of steer feeding, T. I. Mairs and A. K. Risser (*Pennsylvania Sta. Bul. 68, pp. 10*).—Continuing earlier work (E. S. R., 15, p. 894), the relative merits of feeding steers in barns and open sheds were studied with 2 lots of 12 animals each, the experimental conditions being practically the same as before except that the grain ration consisted of corn-and-cob meal and cotton-seed meal 9:1. The feeding records covered 98 days.

The steers fed in the barn made a total gain of 1,017 lbs., requiring 13.81 lbs. of feed per pound of gain, at a cost of 9.87 cts. The steers fed in the shed gained 1,027 lbs., requiring 15.32 lbs. of feed per pound of gain, at a cost of 11.01 cts. During almost the entire period the authors noticed that the steers fed in the barn seemed to have somewhat better appetites than those fed outside. Records were kept of the temperature throughout the test.

"The general result of this experiment is similar to that of the preceding one along the same line, namely, that the steers in the barn ate a little less feed for a pound of gain than those in the open shed. The results, however, differ in this, that whereas in the first experiment the total feed eaten by the steers in the barn was somewhat less than that eaten by those in the shed, in the second experiment the total feed eaten by the steers in the shed was somewhat less than that eaten by those in the barn.

"It would seem that whatever advantage is shown by the barn over the shed as shelter for fattening steers is not due to the higher temperature of the barn, but to some other condition of environment. It is possible that in this case the fact that the shed was not sufficiently bedded, rendering it uncomfortable for the steers, prevented the outdoor lot from making as good gains as they otherwise should have made."

Cuban cattle and pasture grasses, F. C. Giltner (*Breeder's Gaz., 45 (1904), No. 24, pp. 1132–1134, figs. 10*).—Data are given regarding the kind of cattle raised in

Cuba, the methods of handling and slaughtering, and similar topics. As regards Cuban feeding stuffs, the author states that some 30 different varieties of grasses are to be found on the island, but that Parana and Guinea grass are the most important, especially the former.

As regards the importance of meat in the Cuban diet, the author considers it a staple food. "Habana alone slaughters daily 300 head of cattle besides some sheep and hogs. In addition to this, large quantities of dressed, salt, and jerked meats are imported." Very lean meat is preferred.

Little sketches of famous beef cattle, C. S. Plumb (*Columbus, Ohio: Author, 1904, pp. 99*).—The articles included in this volume were originally published in the *Chicago Daily Drovers' Journal* and were written mainly for students of animal husbandry and such readers as are interested in the history of breeds. Twenty-five famous animals are included in the list, 11 of these being Shorthorns, 7 Aberdeen-Angus, 6 Herefords, and 1 Galloway.

These sketches, Professor Plumb states, "were not intended to be extended studies of individuals and their varying relations to the breeds, but were, rather, life sketches giving the more important reasons why the animals discussed became famous. Each animal may be regarded as a really famous one, with important historical breed connections. There are hundreds of other famous animals distributed through a century of Shorthorn, Hereford, Aberdeen-Angus, and Galloway history. . . . Nevertheless, the 25 sketches . . . are of animals that have played most important parts and are clearly entitled to the prominence here given them." The information has been gathered from a variety of sources, many of which are not readily accessible, and the data can not fail to be of use.

Live stock in Mexico, Biorklund (*Diplomatic and Consular Rpts.* [*Great Britain*], *misc. ser., 1904, No. 614, pp. 41*).—The present conditions of the live stock industry in Mexico are described, as well as the efforts which are being made to develop this industry. According to statistics for the year ended June 30, 1902, the approximate number of horned cattle in Mexico was 5,142,475, goats 4,206,011, sheep 3,424,430, horses 859,247 pigs 616,139, mules 334,435, and donkeys 287,991.

Fattening range lambs, J. W. Wilson and H. G. Skinner (*South Dakota Sta. Bul. 86, pp. 16, fig. 1*).—A test covering 111 days was made with 10 lots containing 10 lambs each at the beginning of the trial, to study the relative value of macaroni wheat, spelt, millet (Black veronesh), and some more common grains. In every case 0.5 lb. of grain was fed per head daily at first, the amount being increased as the test progressed. Lot 1 was fed wheat, lot 2 macaroni wheat, lot 3 oats, lot 4 barley, lot 5 spelt, lot 6 millet, lot 7 corn, lot 8 corn and spelt, lot 9 barley and spelt, and lot 10 macaroni wheat and spelt. Prairie grass hay and *Bromus inermis* hay were fed in addition to the grain.

The average daily gain per head ranged from 0.21 lb. on macaroni wheat and spelt to 0.28 lb. on the wheat, the macaroni wheat, and the millet rations. The cost of a pound of gain ranged from 5.2 cts. on corn to 8.2 cts. on macaroni wheat and spelt. Three weeks before the close of the test the sheep were sheared, and the effect of shearing on the results obtained is discussed. The amount of wool ranged from 46.75 lbs. with the lot fed corn to 59.5 lbs. with the lot fed spelt.

As regards the millet, a trial test made with 5 head of sheep had shown that a large proportion of the unground seed was excreted undigested and that the animals did not thrive as they should, consequently, the millet in the feeding experiment reported was coarsely ground. The authors note that during the entire feeding period the lot of lambs receiving this grain were as thrifty and consumed their feed with as much relish and made quite as uniform gains as any other lot.

Among the authors' conclusions are the following:

"The record of the lot fed on spelt in this test confirms the results obtained by

feeding this grain in former experiments that it requires from 1 to 2 lbs. more to produce a pound of gain than with the other grains.

"[The result obtained] indicates that spelt has a greater feeding value for lambs when mixed with other grains than when fed alone.

"Macaroni wheat as a feed for sheep is equal, pound for pound, to bread wheat and can be fed profitably at the prices quoted in this experiment.

"This test indicates that the Black veronesh (*Panicum miliaceum*) variety of millet seed, when ground coarsely, is excellent feed for lambs; and, on account of the advantages for its growth in this State over other commonly grown cereals, it is a very valuable addition to our list of grains for the production of mutton. . . .

"The increase in gain per head daily made after shearing confirms the results of former experiments, as it was larger but not so marked as with the experiment one year ago."

Pig management, G. M. Rommel (*U. S. Dept. Agr., Farmers' Bul. 205, pp. 40, fig. 22*).—In his summary of available data regarding pig management, the author discusses houses, enclosures, fences, and related subjects, the selection of sows and boars, the feeding and management of sows, pigs, boars, and breeding stock, weaning of pigs, and similar topics, as well as the prevention and treatment of disease and the prevention and destruction of vermin.

Franches-Montagnes horses, S. Bieler (*Chron. Agr. Canton Vaud, 17 (1904), No. 12, pp. 366–369, fig. 1*).—A descriptive article.

Poultry experiments, W. P. Brooks and F. R. Church (*Massachusetts Sta. Rpt. 1903, pp. 150–153*).—The relative merits of wheat and corn supplemented by animal meal for egg production were studied from December 14 to September 4, the nutritive ratio of the 2 rations being 1:4.34 and 1:6.24. Considering the test as a whole, the authors state that the 2 rations were practically equal in value. During the winter period, December 14 to April 1, the egg production on the corn ration averaged about 30 and on the wheat ration 28 eggs per 100 hens per day. During the summer period, April 1 to September 4, the relative egg production on the 2 rations was 43.7 and 44.4 eggs. "The average food cost per egg produced was, on the wheat ration, a very slight fraction over 1 cent; on the corn ration it was 0.85 of a cent."

Egg production on wheat and corn was also studied, skim milk being used as a source of animal food in both cases with corn oil added as a source of fat. For the entire period, which was the same as in the first test, the average egg production on the wheat ration was 35.7 eggs and on the corn ration 41.66 eggs per 100 hens per day, which the authors consider good "for fowls kept in close confinement, especially in view of the fact that the pullets used in the experiment were rather late hatched, and laid but few eggs until the first of February." The average cost of food per egg produced was 1 cent on the wheat ration and 0.8 cent on the corn ration.

When wheat was compared with rice, skim milk being used as a source of animal food in both cases, the results were "decidedly in favor of the ration including rice." For the entire period the average egg production was 0.37 egg per hen per day on rice and 0.33 egg per hen per day on wheat, the cost of feed per egg produced in the 2 cases being 2.1 cts. and 1.2 cts.

The results obtained, the authors note, are in some respects in accord with those of previous years (E. S. R., 15, p. 177). Among the conclusions drawn were the following:

"As the result of experiments in previous years, corn had been found superior to wheat rations when animal meal was used as the source of animal food, while with scraps the two rations gave nearly equal numbers of eggs. In previous experiments, with milk albumin as the source of animal food, the egg production has usually been unsatisfactory when wheat has been the principal grain. . . . This year, with the addition of fat, more eggs have been produced. . . . On the other hand, the ration lowest in fat of all, viz, that including rice, has given many more eggs than the ration including wheat, which furnishes a far greater quantity of fat.

"A study of the rations of this year shows an apparent relation between the quantity of fiber in the food and the egg production. The rations furnishing exceptionally large amounts of fiber, derived principally from such grains as oats and barley, have given very inferior yields of eggs.

"In conclusion, we are justified in saying that our experiments do not lend support to the belief that the nutritive ratios of rations fed to hens must necessarily be narrow to produce a satisfactory product. We have obtained more eggs in winter in all experiments this year on the combinations of foods with the wider nutritive ratios, and in two out of three experiments the result was the same for the summer period. . . . It is well understood that animal matter of some kind is essential to good egg production. Our earlier experiments have shown the great superiority of animal to vegetable protein in rations for laying hens. It is believed, however, that suitable animal feeds, under which class may be included all such as are well preserved and sweet and palatable, may be wisely used in connection with a large proportion of our cheapest grain—corn."

Second annual international egg-laying competition, D. S. THOMPSON (*Agr. Gaz. New South Wales, 15 (1904), No. 5, pp. 476–488, figs. 12*).—Data are given regarding the conditions of the egg-laying contest at the Hawkesbury Agricultural College, the rations fed, and the prize winning pens. Maize is regarded as an important feed for poultry.

"Overfeeding with maize is certainly fattening, and is injurious to good results from laying hens, but this competition has demonstrated that maize carefully fed and only in proportion with natural grass feeding, pollard and bran, mash and meat, has no injurious effects, but, on the contrary, gives higher results in egg production."

Considering the test as a whole, the average number of eggs obtained per hen from the 70 pens, in the year covered by the trial, was 163.25, the average value of the eggs per hen $4.27, and the cost of feed per hen $1.395.

DAIRY FARMING—DAIRYING.

Hay substitutes, D. O. NOURSE (*Virginia Sta. Bul. 148, pp. 83–90*).—A shortage of forage crops caused by drought led to tests with dairy cows and beef cattle of various coarse fodders, including straw mixed with silage, corn stover, wet and dry; straw, wet and dry, and cotton-seed hulls, wet and dry. Fairly good results were obtained. Quotations from the author's summary follow:

"Corn stover can be used to excellent advantage as a roughage for beef animals, and with a moderate amount of grain it compares very well with others given hay. For dairy cows, and when used with silage and a moderate grain ration, it makes an admirable food. We have given a herd of dairy cows no roughage for the entire winter, except stover and silage with grain as mentioned. The animals gave every appearance of thrift, and a good flow of milk continued. . . .

"The use of straw can not be so highly commended, and yet it can serve a good purpose, especially when hay is high in price. If given more grain to make up for the deficit in quality of the straw it will carry stock safely through a winter, and even horses may do hard work if given the best of care. Of course if one can get oat straw it is considerably better than that from wheat. For dairy cows, or in fact for stockers to be carried over, if they can have some silage and the straw mixed with it, as mentioned before, they are likely to come out in the spring in a very thrifty condition.

"Of the cotton-seed hulls we can not speak very encouragingly for this section. As one authority states, 'they are in value about equal to oat straw.' From our trial we should so consider them, though we were obliged to tempt the animals by every known means before they would eat them, due very likely to the fact they had never had access to them before. . . .

"In seasons such as the one just passed, when the rainfall is so small in the early spring as to seriously cut off the hay crop, we often look about for some plant to sow to supplement the small hay harvest. Millets are often sown and with excellent results, but corn may be planted later than is usually considered wise, and yet get a valuable crop."

In a test at the station Pride of the North and Leaming corn, planted July 3, yielded, respectively, 4,220 and 3,860 lbs. per acre.

"Considering the late date of planting, the crop was a good one, and makes a very satisfactory 'hay substitute,' and while costing far less per ton than the cotton-seed hulls, was worth much more to us."

Records of individual cows on dairy farms, A. J. GLOVER (*Illinois Sta. Circ. 77, pp. 31, figs. 20*).—This gives the results of tests of 10 dairy herds during the period of one year, and is in continuation of similar work published in a previous bulletin (E. S. R., 15, p. 292). There were 247 cows in the herds at the beginning of the year, and complete records were obtained of 189. Data are given on the care and production of each herd, along with suggestions for the improvement of conditions.

The best individual record was 8,230 lbs. of milk and 483 lbs. of butter; and the poorest, 1,866 lbs. of milk and 90 lbs. of butter. The best herd record was 5,642 lbs. of milk and 308 lbs. of butter; and the poorest, 3,397 lbs. of milk and 153 lbs. of butter. The average production of all the herds was 5,025 lbs. of milk, testing 3.98 per cent of fat, and equivalent to 233 lbs. of butter.

Effect of feed on the composition of milk and butter fat, and on the consistency or body of butter, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1903, pp. 45–62*).—This has been noted from another source (E. S. R., 15, p. 1110).

Milk and its products in pharmacy and in occult science of early times, K. TEICHERT (*Milch Ztg., 33 (1904), No. 32, pp. 499, 500*).—A contribution to the medical superstition of past centuries.—F. W. WOLL.

Trials of a hand-milking machine, HITTCHER (*Milch Ztg., 33 (1904), No. 24–25, pp. 369–371, 389–391*).—The machine tried is of German origin, invented by Andersen-Schmidt (German patent, No. 118,825). A description of the machine is given in the paper, and the author's experience with the same in the dairy herd of Kleinhof-Tapiau. This was on the whole favorable, but the author considers the machine, like the Thistle milking machine, a makeshift which in no way can take the place of a good milker.—F. W. WOLL.

Trial of the Andersen-Schmidt hand-milking machine, H. WEIGMANN (*Milch Ztg., 33 (1904), No. 29, pp. 449–451*).—The author gives a description of the machine (accompanied by 2 illustrations) and of the trials conducted with the same on a Schleswig-Holstein dairy farm.

The cows gave less milk at the start by the machine than by hand milking, but as they became accustomed to the former the difference apparently disappeared. In a trial with 4 cows the average results obtained by machine and by hand milking during three 4-day periods were as follows: Periods I and III (machine), milk 30.3 and 29.3 liters, fat 1.15 and 1.09 kg.; Period II (hand milking), milk 30.3 liters and 1.18 kg. of fat. A second trial conducted with 4 cows in 5 periods of 4 days each, during which machine and hand milking were alternated, gave the following results:

Comparison of hand and machine milking.

Period.	Method of milking.	Yield of milk.	Fat content.	Yield of fat per day.
		Liters.	*Per cent.*	*Kilograms.*
I	Machine	20.5	3.94	0.807
II	Hand	21.4	4.13	.893
III	Machine	20.5	3.93	.806
IV	Hand	20.3	4.13	.837
V	Machine	18.8	3.92	.741

In the author's opinion, it may be safely assumed that the production of milk and butter fat is not at all, or at least not appreciably, affected by machine milking, when the cows have once become accustomed to being milked by the machine.

The machine will be further tried on several other Schleswig-Holstein dairy farms, in order to determine its practicability under ordinary farm conditions, in how far it can be used by common farm laborers, and to what extent previously hand-milked cows can adapt themselves to machine milking.—F. W. WOLL.

New experiences with the Thistle milking machine, CASPAUL (*Milch Ztg., 33 (1904), No. 39, pp. 611–613*).—A general discussion of the various pros and cons of milking machines, based upon a 4-years' experience with the Thistle on a German dairy farm, where fresh milking cows are purchased and sold for beef after ¾ to 1½ years, when they no longer give milk. Under these conditions, at least, the author considers the machine a success.—F. W. WOLL.

A trial of the Hegelund method of milking in Holland, K. H. M. VAN DER ZANDE (*Milch Ztg., 33 (1904), No. 32, pp. 502, 503*).—The following average results were obtained in a trial with 12 cows separated into two groups:

Comparison of Hegelund and ordinary methods of milking.

[Average yields per day for 6 cows.]

Period.	Group I.			Group II.			Difference between groups I and II.	
	Method of milking.	Yield of milk.	Yield of fat.	Method of milking.	Yield of milk.	Yield of fat.	Yield of milk.	Yield of fat.
		Kg.	*Kg.*		*Kg.*	*Kg.*	*Kg.*	*Kg.*
I	Ordinary, 5 days	144.4	4.396	Ordinary	125.2	3.724	19.2	0.672
II	Hegelund, 1 week	138.4	4.091	Ordinary	123.9	3.540	14.5	.551
III	Hegelund, 10 days	131.8	3.960	Ordinary	116.6	3.384	15.2	.576
IV	Ordinary, 13 days	125.2	3.571	Ordinary	106.8	3.021	18.4	.550

While no appreciable differences in the production of milk or butter fat were obtained in the trial, the author attaches considerable significance to the indirect influence of the Hegelund method and to Hegelund's work in emphasizing the importance of the process to milking.—F. W. WOLL.

Observations in regard to the Bergedorfer regenerative milk pasteurizer, P. VIETH (*Milch Ztg., 33 (1904), No. 37, pp. 579–582*).—Results of a 7-months' test in the Hameln creamery are presented and discussed.—F. W. WOLL.

On the value of the minute fat globules of milk for butter making, KLEIN (*Milch Ztg., 33 (1904), No. 18, pp. 276–279*).—The author conducted a number of churning experiments with normal cream obtained by poor centrifugal skimming, and with mixtures of such cream and that obtained by running rich skim milk through the separator a second time. The fat content of the cream churned on comparative experiments was always brought to a similar percentage by admixture with skim milk.

The results show that the percentage churnability was the same in all comparative trials, and that, therefore, fat globules of minute size which remain in the skim milk, except by the closest skimming, also contribute to the yield of butter. The time of churning was found to be influenced only to a slight extent by the closeness of the skimming.—F. W. WOLL.

Bacteriological-chemical studies of butter in the Province of Posen, K. TEICHERT (*Inaug. Diss., Univ. Lausanne, 1904*).

Skimming experiments with a balance centrifuge, model 1904, H. HÖFT and KURR (*Milch Ztg., 33 (1904), No. 36, pp. 563–566*).—An illustrated description of this centrifuge, of the manufacture of Hollersleben Carlshütte in Flensburg, with results of experiments with the same.—F. W. WOLL.

The production of butter and the butter control in the Netherlands (*Rpts. and Mem.* [*Netherlands*] *Agr. Dept., 1904, No. 1, pp. 45, chart 1*).—This is a descriptive, historical, and statistical report on butter production in the Netherlands, with a description of the cooperative system, dairy associations, and the operations of the butter control stations.

Report of the chemist: Division of foods and feeding, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1903, pp. 37–44*).—This part of the report is an outline of the work done during the year. Statements are made concerning the extent and character of the chemical work done, the results of the inspection of feeding stuffs, the execution of the dairy law, and the testing of dairy herds.

VETERINARY SCIENCE AND PRACTICE.

Report of the State veterinarian, D. F. LUCKY (*Ann. Rpt. Missouri State Bd. Agr., 36* (*1903*), *pp. 33–48, 351–367*).—During the year under report the author's attention was chiefly occupied in the study of outbreaks of Texas fever, glanders, sheep scab, cattle mange, hog cholera, malignant catarrh, rabies, and tuberculosis. A detailed list of the visits made by the State veterinarian in fulfilling his duties is also presented. It is recommended that more of the control work be left in the hands of deputy veterinarians in order that the traveling expenses may be reduced. The desirability of publishing bulletins containing popular information on animal diseases is also suggested.

Veterinary department, L. L. LEWIS (*Oklahoma Sta. Rpt. 1904, pp. 46–52*).—The author discusses vaccination for black leg, the treatment of cattle mange, lumpy jaw, and hog cholera. As a dip for the cure of cattle mange the author recommends zenoleum, or chloro-naphtholeum in 1½ to 2 per cent solution.

Report of the bacteriological station of the Kharkov Veterinary Institute for 1902 (*Kharkov, 1903; rev. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *5* (*1904*), *pt. 1, p. 141*).—The report contains an account of the results obtained by the use of anthrax vaccine in controlling this disease among sheep, horses, and cattle. During this work the double vaccine was used, the interval between vaccination being 13 days. The losses from vaccination did not exceed 1 per cent for sheep and 0.25 per cent for horses and cattle. Immunity against anthrax appeared to exist for a period of 2 years.—P. FIREMAN.

Second annual report of the superintendent of government laboratories, P. C. FREER (*Ann. Rpt. Philippine Com., 1903, II, pp. 342–387, pls. 13*).—The author outlines briefly the growth of the laboratory, the preparation of serum, and gives an account of the buildings and equipment. Mention is also made of the biological and entomological work in these laboratories.

A special report on the work of the serum laboratory is presented by J. W. Jobling. In this laboratory a great amount of work has been done in the preparation of rinderpest serum and a study of the pathological anatomy of this disease, methods of transmission, symptoms, and preventive measures. Various methods of immunization were tested including the use of a mixture of glycerin and bile from affected animals, the serum method, and the defibrinated blood method.

Report of the director of the biological laboratory, R. P. STRONG (*Ann. Rpt. Philippine Com., 1903, II, pp. 411–594, pls. 29, figs. 64*).—Considerable work was done in this laboratory in a study of amebic dysentery and in making blood tests and doing other routine work for physicians. A special report on trypanosoma, with reference to surra in the Philippine Islands, is presented by W. E. Musgrave and M. T. Clegg. This part of the report has already been noted from another source (E. S. R., 15, pp. 1131 and 1132).

A report on hemorrhagic septicemia in animals in the Philippine Islands is presented by P. G. Woolley and J. W. Jobling. This disease is said to have caused very heavy losses and was felt most severely in regions which had already been devastated by rinderpest. Detailed notes are given on a considerable number of cases and experiments are reported during which laboratory animals were inoculated and studied for the purpose of determining the course and symptoms of the disease. It is recommended that all affected animals be prevented from gaining access to running water which might carry contagion to other animals, although it is by no means certain that hemorrhagic septicemia is contagious.

The results of physiological investigations, L. Asher and K. Spiro (*Ergebnisse Physiol., 3 (1904), pp. 636, pls. 5*).—This section of the report on physiological studies is devoted to biochemistry, including the subject of blood elements and chemical bodies found in the serum and blood corpuscles, the chemistry of spermatozoa, intestinal fermentation, general cellular chemistry, activity of the salivary glands, fermentive cleavage of fat, the influence of active pharmacological principles on metabolism, nitrogen metabolism in plants, the physiology of pentoses, formation of carbohydrates from protein, and a review of experiments on metabolism and energy in the human body. This last review was prepared by W. O. Atwater.

Animal sanitation, E. Van Godtsenhoven (*Bul. Cercle Études Agron. [Brussels], 1903, No. 8, pp. 363–368*).—Attention is called to the importance of securing proper food, ventilation, temperature, and exercise for domesticated animals so as to prevent so far as possible the development of tuberculosis and other diseases.

Protozoan diseases, F. J. Bosc (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 4, pp. 487–493*).—Diseases due to protozoa are called bryocytic on account of the fact that as indicated by this term the diseases in question are characterized by a proliferation of cells. According to the author's classification the diseases included in this group are smallpox, sheep pox, foot-and-mouth disease, rabies, etc. The essential pathological lesions of these diseases are described.

The bactericidal power of the blood, O. Bail (*Sitzber. Deut. Naturw. Med. Ver. Böhmen, n. ser., 23 (1903), pp. 96–100*).—Attention is called to the importance of understanding as thoroughly as possible the various bodies found in the blood. This work is regarded as necessary in the scientific study of the problem of immunity. The well-known fact of the bactericidal power of the blood of immunized animals has usually been attributed to the formation of special bodies in the blood under the influence of the pathogenic bacteria or to the increased destructive action of certain leucocytes. These matters require further study.

Actinobacillosis, C. H. Higgins (*Canada Dept. Agr., Biol. Lab. Bul. 1, pp. 8, pls. 8*).—This disease was studied on 4 cases in Canada and was found to be identical with the disease described by Lignières and Spitz in Argentina, but not so virulent. Detailed clinical notes are given on the 4 cases which came under the author's observation.

The gross lesions are very similar to those of actinomycosis. The pus, however, is characteristic, of a semi-solid consistency, almost transparent and containing white granules barely visible to the naked eye. The pathogenic organism of the disease closely resembles that of fowl cholera. Guinea pigs inoculated intraperitoneally died in from 19 to 21 days. Similar lesions are produced by artificial inoculation of rabbits. The author has conducted no experiments with remedies, but recommends large doses of potassium iodid.

The action of bacteria on toxins coming from other species of bacteria, Garnier and G. Sabaréanu (*Arch. Méd. Expér. et Anat. Path., Paris, 1. ser., 16 (1904), No. 5, pp. 557–570*).—The authors' experiments were confined to the diphtheria and anthrax bacilli and to toxins of tetanus and diphtheria. It was found during a study of these bacteria and toxins, especially by means of inoculation experiments with

guinea pigs, that the resistance of the diphtheria toxin was rather different toward the diphtheria bacillus and bacillus of anthrax. A long series of experiments were made to determine the effect of these bacilli upon the toxin of tetanus.

As a general result of the experiments reported in this paper, it is concluded that the action of bacteria upon toxins is variable and depends upon the organisms and toxins concerned. The diphtheria bacillus destroys the diphtheria toxin, but increases the virulence of the tetanus toxin. On the other hand, anthrax bacillus destroys tetanus toxin but intensifies the toxin of diphtheria. Apparently the destruction of the tetanus toxin by the anthrax bacillus is due to the direct action of the bacillus upon the toxin. Old tetanus toxin attenuated by simple contact with the air and light, and especially toxin which has been subjected to the action of the anthrax bacillus, still retains a certain toxic property, although the power of producing tetanus has been lost.

Annual report on progress in the study of pathogenic micro-organisms, P. VON BAUMGARTEN and F. TANGL (*Jahresber. Fortschr. Lehre Path. Mikro-organ., 18 (1902), 1. Abt., pp. 368*).—As usual in these annual reports the present volume contains brief abstracts of text-books, compendiums, and original treatises on the various pathogenic micro-organisms, whether bacteria, fungi, or protozoa. Detailed classified bibliographical lists are presented at the beginning of each section of the volume.

A text-book upon the pathogenic bacteria, J. MCFARLAND (*Philadelphia: W. B. Saunders & Co., 1904, 4. ed., pp. 629, figs. 153*).—This is a revised and enlarged edition of the author's text-book on pathogenic bacteria. The subjects discussed in the volume include the biology of bacteria, infection, immunity, disinfection, cultivation of bacteria, experimentation upon animals, and other general bacteriological topics, together with detailed accounts of the organisms concerned in the production of various diseases of man and animals, including pneumonia, tuberculosis, glanders, actinomycosis, tetanus, rabies, anthrax, chicken cholera, hog cholera, swine plague, malignant edema, black leg, etc.

Bacteriological studies, B. GALLI-VALERIO (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 4, pp. 465–471, figs. 6*).—Detailed notes are given on the growth and behavior in various culture media of *Corynebacterium vaccinæ*, *Bacterium diphtheriæ avium*, and *B. candidus*. It was found during a study of roup in fowls that the roup organism was very susceptible to the action of lemon juice and that nearly all infected birds treated by repeated doses of this substance recovered entirely.

Veterinary police ordinance of March 3, 1904 (*Min. Int. [Italy], Ord. Pol. Vet., Mar. 3, 1904, pp. 20, pls. 3*).—A copy is given of an ordinance of the veterinary police under the Minister of the Interior of Italy for the prevention and control of infectious diseases among animals.

Veterinary dictionary, II, P. CAGNY and H. J. GOBERT (*Dictionnaire vétérinaire. Paris: J. B. Baillière & Sons, 1904, vol. 2, pp. 854, pls. 4, figs. 932*).—This constitutes the second volume of the author's veterinary dictionary and completes the work. It includes all material arranged in an alphabetical manner from I to Z.

Directions for meat inspectors, R. OSTERTAG (*Leitfaden für Fleischbeschauer. Berlin: Richard Schoez, 1904, pp. XIV+314, figs. 176*).—The purpose of the present volume is to furnish information for persons without a veterinary training concerning the more common pathological conditions met with in meat inspection, and also concerning the normal appearance of various parts and organs. Chapters are devoted to the legal foundation of meat inspection, the training of meat inspectors, methods of butchering, infectious diseases, animal parasites, preservation and sterilization of meat, etc.

Statistics on German meat inspection, R. EDELMANN (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 41, pp. 405–408*).—Brief notes are given on the methods of preparing the statistics obtained from the inspection of animals and meat in abattoirs, and

attention is called to the valuable results which may be obtained by proper interpretation of these statistics.

Tuberculosis of the retropharyngeal glands in cows, E. LIÉNAUX (*Ann. Méd. Vét., 53 (1904), No. 9–10, pp. 515–519*).—The importance of alterations in these glands as evidence of infection with tuberculosis is briefly noted. Detailed descriptions are also presented of the clinical symptoms of this affection in 2 cases. In the first case, respiration was accelerated and was somewhat interfered with as a result of the swelling of the retropharyngeal glands. The temperature of the animal remained about 39° C. In the second case, an apparent amelioration took place and persisted for 2 months. This, however, should in no case be taken as evidence of recovery from the disease.

Tuberculosis in its relation to the dairying industry, J. R. WEIR (*Jour. Dept. Agr. Victoria, 2 (1904), No. 8, pp. 750–756*).—Notes are given on the history, distribution, cause, symptoms, and treatment of this disease, especially as observed in various parts of Australia.

Bovine tuberculosis, V. A. MOORE (*Rpt. New York State Dept. Agr., 10 (1902), pp. 199–252, pls. 8, figs. 3*).—In this report the author presents a general account of this disease discussing in considerable detail its etiology, distribution, prevalence, symptoms, pathology, and treatment. Notes are given on the use and value of tuberculin tests and recommendations are made regarding the methods of procedure with tuberculous cattle.

Report of the State commission on bovine tuberculosis (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 313–323*).—During the year 2,450 cattle were examined, of which number 473 were found to be tuberculous and were condemned. The average indemnity paid for cows was $24.17. A brief discussion is presented of the causes of infection from tuberculosis, together with notes on general sanitation and methods of preventing the spread of this disease.

Tuberculosis a preventable disease, with especial consideration of the distribution of tubercle bacilli and the usual avenues of infection, J. F. CORBETT (*Trans. Minnesota State Med. Assoc., 36 (1904), pp. 218–229*).—Attention is devoted in this article to the subject of bovine tuberculosis as one of the well-known sources of infection for the disease in man. While it is admitted that a large number of cases of human tuberculosis are of intestinal origin and arise from infection with bovine tubercle bacilli, the importance of pulmonary infection is insisted upon. Brief notes are given on the work of various investigators which show that human and bovine tuberculosis are forms of the same disease.

Pulmonary pseudo-tubercles in cattle due to arteritis, H. ZWAENEPOEL (*Ann. Méd. Vét., 53 (1904), No. 9–10, pp. 522–526, figs. 3*).—As a result of arteritis of various forms multiple thrombi and infarcts may be formed and may become lodged in the blood vessels of the lungs, thus giving rise to tubercles resembling those of true tuberculosis. The author discusses the differential diagnosis between such tubercles and tuberculosis, and describes in detail the nodules which were observed in a case of this sort.

An agglutinating substance in the organism of animals possessed of natural immunity, P. ZABOLOTNOFF (*Ann. Inst. Pasteur, 18 (1904), No. 8, pp. 527–534*).—The literature of this subject is briefly reviewed. The author studied the effect of the normal serum of guinea pigs from the blood of hogs. The technique of the experiments is described in detail. It was found that the serum of guinea pigs contains no specific agglutinin for the bacillus of swine erysipelas. Evidence is presented to show that the protection of hogs against this micro-organism is brought about entirely through the action of the leucocytes.

Glanders in horses, with an account of its transmission to man, PROFÉ (*Fortschr. Vet. Hyg., 2 (1904), No. 6, pp. 167–170*).—In one case of glanders in a horse

the condition of the animal became considerably worse after an intravenous injection of colloidal material. The body temperature rose and the laryngeal glands showed excessive swelling. A subsequent mallein test indicated the presence of glanders, the temperature rising to 40.6° C. The disease was also transmitted to an attendant, in whom it resulted fatally.

Contagious abortion in cattle (*Bd. Agr. and Fisheries* [*London*], *Leaflet 108, pp. 14*).—Simple or sporadic abortion is described for the purpose of distinguishing it from the contagious form of the disease. Brief notes are given on the results obtained by the internal administration of carbolic acid and the external use of various antiseptics in the treatment of this disease.

As a result of these experiments it is recommended that all aborting cows should be isolated and no longer used for breeding purposes. Sheds should be treated with a lime wash every 3 months and the parts of the buildings which can not be reached may be sprayed with some other antiseptic. All cows in the herd should be treated externally with some antiseptic solution. For this purpose the author recommends Izal, 1 part to 80 parts of water.

African coast fever, W. ROBERTSON (*Agr. Jour. Cape Good Hope, 25* (*1904*), *No. 3, pp. 262–268, pl. 1, figs. 15*).—The symptoms, post-mortem occurrence, cause, and means of infection of this disease are briefly described. The disease may be transmitted through the agency of the brown tick and the black-pitted tick, but chiefly by means of the former. The inoculation method devised by R. Koch is said to have proved ineffective in practice. Attention is directed to the importance of proper fencing and dipping for the destruction of ticks. Infested animals may be freed from ticks by dipping in kerosene and various arsenical and other dips.

Distribution of coast fever ticks, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 25* (*1904*), *No. 3, pp. 268–270, pl. 1*).—The distribution of *Rhipicephalus appendiculatus*, *R. simus*, *R. evertsi*, and *R. capensis* is briefly outlined, with an account of the agency of the first 2 species in the distribution of African coast fever.

The sheep fluke, N. A. COBB (*Agr. Gaz. New South Wales, 15* (*1904*), *No. 7, pp. 658–669, fig. 1*).—Attention is called to the agency of birds, especially ducks, in the destruction of snails which may carry the intermediate stage of liver fluke. These birds must, therefore, be considered as of some importance in the control of liver-fluke disease. Occasionally the liver fluke is found in the liver of the kangaroo, hare, rabbit, and wallaby, but nearly always in small numbers.

During the author's investigation of this subject it was found that the extent of infestation by liver flukes may be accurately estimated by a determination of the number of eggs in the excreta. The eggs are distributed in a uniform manner in the excreta of the sheep. It is necessary to carry on further experiments in order to determine the variation in a number of eggs due to age, breed, kind of feed, and length of infestation.

Infectious diarrhea in lambs, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 25* (*1904*), *No. 3 pp. 281–283*).—A study of several outbreaks of this disease in lambs led to the conclusion that the disease is due to a pathogenic organism which gains entrance to the young animal through the navel cord at the time of birth. The disease may most successfully be prevented, therefore, by antiseptic treatment.

Official treatment of swine plague, F. GLAGE and C. NIEBERLE (*Fortschr. Vet. Hyg., 2* (*1904*), *No. 6, pp. 161–167*).—Brief statements are made regarding the regulations of the veterinary police in various parts of Prussia with reference to swine plague. The authors discuss the value of these regulations in controlling the disease. With regard to the carcasses of infected hogs the authors held the opinion that the meat is not injurious to health and need not be considered of inferior value except in cases of great emaciation or jaundice as a result of the disease. Further experiments are required to determine the harmful or harmless character of the milk of infected hogs.

Prevention of swine diseases, A. T. PETERS (*Agriculture [Nebraska], 3 (1904), No. 6, pp. 10, 11*).—As an intestinal and antiseptic vermifuge the author recommends the use of a coal-tar creosote solution in water at the rate of 1:100. A formula is also presented for the preparation of a tonic to be administered in cases of hog cholera.

Vaccination for hog diseases, GRAFFUNDER (*Berlin. Tierärztl. Wchnschr., 1904, No. 41, pp. 673, 674*).—A brief outline is given of the vaccination methods proposed by Ostertag and Schreiber. The former system consists in the use of a polyvalent serum and is based on the assumption that young pigs, after receiving this serum, have the power of developing an active immunity toward the disease whenever they happen to become naturally inoculated with pathogenic bacteria. The use of septicidin on the other hand is combined with artificial inoculation of pure cultures. These methods have been tried on a number of animals, but the author hesitates to draw final conclusions regarding the results. It is believed, however, that the experiments should be continued on a larger number of animals, and it is recommended that the district government undertake to assume the expense of such experiments.

Report of the State board of health, H. MITCHELL (*Ann. Rpt. New Jersey State Bd. Agr., 31 (1903), pp. 327–329*).—A list is presented of the cases of glanders observed in the State during the year, with notes on the disposal of such animals, and a brief account of an outbreak of anthrax during which 172 animals died.

The prevention of anthrax, U. E. FERRETTI (*Gior. R. Soc. ed. Accad. Vet. Ital., 53 (1904), No. 40, pp. 937–942*).—As the result of an extended study of anthrax in the vicinity of Rome the author comes to the conclusion that notification of the existence of this disease should be compulsory, and recommends that more attention be given to disinfection and the destruction of the carcasses of animals dead of the disease. Vaccination of exposed animals in infected localities should also be required.

Fowl diphtheria, H. STREIT (*Ztschr. Hyg. u. Infectionskrank., 46 (1904), No. 3, pp. 407–462, pls. 3*).—The symptoms, etiology, and pathological anatomy of roup are discussed in considerable detail. The roup bacillus is described and mention is made of its behavior on different culture media. The virulence of the roup bacillus was considerably increased by repeated passage through pigeons. It was found to be pathogenic for rabbits, guinea pigs, and mice, as well as for pigeons and fowls. The disease was apparently transmitted more easily by mere association of sick with healthy fowls than by direct inoculation. Immunization and inoculation experiments showed that roup is a disease quite distinct from diphtheria of man.

Epithelioma in pigeons, THÉZÉE (*Bul. Soc. Études Sci. Angers, n. ser., 32 (1903), pp. 71, 72*).—The author notes the occurrence of epithelioma upon the walls of the stomach in pigeons and describes in some detail the pathological anatomy of these structures, calling attention to their similarity to cancer in man.

A new parasite (Strongylus quadriradiatus) found in the pigeon, E. C. STEVENSON (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 47, pp. 6, figs. 10*).—According to the author this is the first species of Strongylus reported as occurring in pigeons. It was present in large numbers in a flock of pigeons, the larger part of which recently died during the outbreak of an unknown disease. The worm is described with detailed anatomical notes on its various features. The greatest injury is apparently caused by the worms burrowing into the mucous layer of the intestines, thus offering a point of entrance for pathogenic bacteria.

Demonstration of specific parasites in rabies, L. LUZZANI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 4, pp. 540–545, pl. 1*).—The author was able to demonstrate the presence of the peculiar organisms described by Negri and believes that these are to be considered as the cause of rabies.

Blood parasites, O. MALM (*Norsk Vet. Tidsskr., 16 (1904), No. 4, pp. 81-92, figs. 4*).—A review is given of blood parasites belonging to the group protozoa, particularly the malarial organism, and its relation to mosquitoes.

Animal parasitology, M. NEVEU-LEMAIRE (*Parasitologie animale. Paris: F. R. de Rudeval, 1904, 2. ed., pp. 220, figs. 301*).—A discussion is presented of the habits, life history, and economic importance of animal organisms which are in any way injurious to man. These parasites belong to 9 natural orders of the animal kingdom particularly to Vermes and Arthropoda. The habits, life history, and injurious effects of each species are briefly noted with reference to methods of combating them.

AGRICULTURAL ENGINEERING.

Preparing land for irrigation and methods of applying water (*U. S. Dept. Agr., Office of Experiment Stations Bul. 145, pp. 84, pls. 7, figs. 33*).—"The purpose of this bulletin is to bring together the results of actual experience in preparing land for irrigation, for the benefit of farmers who are now irrigating or who may in the future undertake the reclamation of lands now arid. The information contained in this report as to the tools and implements used, the methods to be employed, and the cost of the work is based on actual examples and affords a reliable guide to the cost of these features of irrigation in the districts represented, while the number and wide distribution of these districts will make possible approximate estimates of the cost of the different methods and will help greatly in the selection of the one best suited to given conditions."

The general discussion and comparison of methods of preparing land for irrigation described in this bulletin, the descriptions of furrow irrigation, the check system of irrigation, the use of flumes and pipes in furrow irrigation, the basin method of irrigation as practiced in the Santa Clara Valley, California, and irrigation by flooding as practiced in Gallatin Valley, Montana, were prepared by S. Fortier.

The use of metal pipe and canvas hose in the irrigation of field crops in California is described by A. P. Stover; preparing land for irrigation in Salt Lake Basin, by E. R. Morgan and A. P. Stover; the clearing and leveling of land in Imperial Valley, California, by J. E. Roadhouse; irrigation by the furrow system in Washington, by C. G. Elliott; irrigation practice in Nevada, by G. H. True; while methods of preparing land for irrigation in use in western Kansas, in Nebraska, and in Wyoming are described by L. G. C. Mayer, O. V. P. Stout, and William Francis Bartlett.

Professor Fortier and R. P. Teele, editorial assistant in this Office, edited and arranged the report for publication.

Report on drainage investigations, 1903, C. G. ELLIOTT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 147, pp. 62, pls. 5, figs. 12*).—This report covers the first year's work in drainage investigations by this Office. It explains the importance of drainage in the United States and describes plans which have been made and put in operation "for reclaiming alkali lands at Fresno, Cal., in Yakima and Atanum valleys, Washington, and in Grey Bull Valley, Wyoming; plans for the drainage of overflowed bottom lands in the Missouri Valley in Iowa; and experiments with the use of drains to prevent hillside erosion in Georgia."

Sanitary conditions in the home and on the farm, H. METCALF (*South Carolina Sta. Bul. 89, pp. 31, figs. 9*).—This is a popular bulletin on sanitation. The topics discussed are the dangers of dust, school-room sanitation, sewage disposal, disinfectants, water supply, milk, food, and the dangers from insects.

Current wheels: Their use in lifting water for irrigation (*U. S. Dept. Agr., Office of Experiment Stations Bul. 146, pp. 38, pls. 4, figs. 21*).—This bulletin contains a discussion of the theory of current wheels, and descriptions, photographs,

and drawings of a large number of wheels now in use in California, Colorado, Idaho, Utah, and Washington, with notes on their good and bad features.

The importance of the water supply in agriculture, STRECKER (*Fühling's Landw. Ztg., 53 (1904), Nos. 10, pp. 357–360; 11, pp. 398–407*).—A general discussion of the importance of a water supply for power purposes, domestic uses and watering stock, and irrigation.

Machinery at the general agricultural exposition of Paris, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 7 (1904), Nos. 11, pp. 356–359, figs. 6; 12, pp. 388–392, figs. 12; 13, pp. 421–426, figs. 9; 14, pp. 448–452, figs. 9*).—Accounts are given of traction motors, cultivators, seed and fertilizer distributors, weeders, spray machines, harvesting and thrashing machines, mills for grinding, pasteurizers, pumps, centrifuges, hail protection cannon, and miscellaneous implements and machines.

MISCELLANEOUS.

Thirteenth Annual Report of Oklahoma Station, 1904 (*Oklahoma Sta. Rpt. 1904, pp. 15–68*).—This includes a report of the director; a summary of the press bulletins issued during the year, meteorological data noted elsewhere, and a financial statement for the fiscal year ended June 30, 1904.

The press bulletins are to a certain extent a repetition of matter printed in the regular bulletins of the station and deal with a variety of subjects, including the following: Wheat experiments, pasturing wheat, delayed germination of wheat, the oat crop, seed for spring crops, choosing seed corn, comparative yields of Kafir corn and Indian corn, forage rape, Bermuda grass, ponds for stock water, steer-feeding experiments, preventing blackleg, cattle mange or Texas itch, lumpy jaw, hog cholera, plant windbreaks, fruit varieties, planting red cedar seed, Arbor Day, methods of combating the Hessian fly, checks for migrating caterpillars, the webworm on cotton and alfalfa, and a disease of the privet. New matter contained on the above subjects has been noted elsewhere in this issue.

Sixteenth Annual Report of Massachusetts Station, 1903 (*Massachusetts Sta. Rpt. 1903, pp. 175*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; reports of heads of departments; and miscellaneous articles abstracted elsewhere.

Australia as a food-producing country, C. C. LANCE (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 4, pp. 255–272*).—The resources of Australia are described and discussed.

Wages and cost of living (*U. S. Dept. Com. and Labor, Bureau of Labor Bul. 53, pp. 703–932*).—As shown by data regarding the incomes and expenditures of 2,567 families, collected in 33 States during the year 1901, the average expenditure for food was $326.90 per family, or 42.54 per cent of the expenditure for all purposes. Among other data the article contains statistics of retail prices of the more important foods, wages, hours of labor, etc.

60 per cent of whom are said to be engaged in scientific investigation and its application to the farm, the orchard, and the garden. It will thus be seen that there are now about 300 persons connected with the investigation work of this Bureau alone, a number which far exceeds the total number of men in these lines at all of the experiment stations.

Awards to Collective College and Station Exhibit at St. Louis Exposition.—The following is a list of the awards granted to institutions and individuals on exhibits which formed a portion of the Collective Exhibit of the Colleges of Agriculture and Mechanic Arts and the Experiment Stations:

Grand prizes.—(1) Association of American Agricultural Colleges and Experiment Stations, collective exhibit of the colleges and stations, made by the committee of the association; (2) section of agronomy, in charge of J. I. Schulte, collective exhibit showing courses of instruction, and methods and results of investigations on field crops; (3) section of horticulture and forestry, in charge of S. B. Green, collective exhibit illustrating courses of instruction, and methods and results of investigation in horticulture and forestry; (4) section of economic entomology, in charge of C. P. Gillette, collective exhibit illustrating courses of study in entomology, and collection of economic insects; (5) dairy laboratory, in charge of E. H. Farrington; (6) sugar laboratory, in charge of W. C. Stubbs; (7) plant laboratory, in charge of W. H. Evans; (8) Alabama Station, exhibit showing cotton experiments; (9) Connecticut State Station, tobacco exhibit, tent model illustrating the culture of tobacco under shade, and grass garden exhibit, by E. H. Jenkins; (10) Illinois Station, corn breeding experiments, by C. G. Hopkins; (11) Louisiana Station, exhibit illustrating cane sugar investigation; (12) Minnesota Station, wheat breeding exhibit, by W. M. Hays; (13) Missouri Station, models representing the results of experiments in cattle feeding; (14) Missouri University, models showing comparative hardiness and phenology of peach twigs of different colors, and winter forcing of asparagus in the open field; (15) University of Missouri, cultures of mushrooms and other fungi, by B. M. Duggar; (16) Pennsylvania Station, working model of respiration calorimeter for domestic animals; (17) University of Wisconsin, dairy instruction and results of investigation; (18) S. M. Babcock, of Wisconsin, the original Babcock milk tester; (19) Office of Experiment Stations, statistics, charts, and publications relating to the American stations and the Office of Experiment Stations; (20) Bureau of Education, charts and publications.

Gold medals.—(1) Section of animal husbandry—investigation, in charge of H. P. Armsby; (2) section of animal husbandry—instruction, in charge of Thomas F. Hunt; (3) section of fertilizers, in charge of E. B. Voorhees; (4) section of plant pathology, in charge of F. C. Stewart; (5) section of rural engineering, in charge of Elwood Mead; (6) section of veterinary medicine, in charge of D. S. White; (7) soils laboratory, in charge of M. F. Miller; (8) Arizona Station, collection of date palms and date-palm products, by R. H. Forbes; (9) B. C. Buffum, of Wyoming, automatic water register; (10) California University, soil samples and investigations, by E. W. Hilgard; (11) Connecticut State Station, collection of pure vegetable proteids; (12) Connecticut Storrs Station, cultures of milk bacteria, by H. W. Conn; (13) Cornell University, exhibit of root crops; (14) Cornell University, apparatus for photographing cultures of bacteria and fungi, by G. F. Atkinson; (15) University of Illinois, photographs and records showing relative efficiency of dairy cows, by W. J. Fraser; (16) Maine Station, study of comparative value of hens for egg production; (17) Michigan Agricultural College, models of fruits, collection of photographs and models illustrating work and results in horticulture and forestry; (18) University of Minnesota, model greenhouse laboratory bench, and forestry exhibit; (19) Missouri Station, breeding cage, photographs of laboratories and equipment for work in economic entomology, and collection of beneficial insects; (20) New Jersey Stations, typical soils and ferti-

lizers; (21) New York State Station, charts and graphic representation of investigations on sources of milk fat; (22) New York State Station, charts showing effect of temperature in curing and paraffining cheese, and losses in manufacture, by L. L. Van Slyke; (23) New York State Station,[a] exhibit showing correlation between specific gravity of seed and germinating power and vigor of resulting plant, models of grapes and grape pollen showing correlation between character of pollen and self-fertility of the variety; (24) New York State Station, collection of commercial feeding stuffs, illustrating inspection work; (25) North Dakota Station, exhibit of flax breeding and of root systems; (26) Ohio State University, collection of normal and diseased bones from horses and oxen illustrating more common diseases and fractures; (27) Purdue University, apparatus for recording the growth of plants, by J. C. Arthur; (28) Tennessee Station, apparatus and investigations on effect of fungicides on foliage, by S. M. Bain; (29) Texas Agricultural College, cages for breeding insects, the boll weevil and its injuries, and card system of keeping notes and records; (30) Utah Agricultural College, exhibit of work in domestic science; (31) Virginia Station, pure cultures for use in fermentation industries, by W. B. Alwood; (32) Washington Station, results of wheat breeding, illustrating Mendel's law.

Silver medals.—(1) Section of biological sciences, in charge of G. E. Stone, collection illustrating work in biological sciences at the land-grant institutions; (2) section of inspection work, in charge of M. A. Scovell, collection illustrating inspection work of the stations; (3) Arkansas Station, exhibit showing experimental work with cowpeas; (4) Connecticut State Station, wood engravings showing the microscopic structure of cattle feeds; (5) Hampton Normal and Agricultural Institute, courses of instruction, and samples of student work; (6) Hawaii Station, collection of fruits illustrating improvements; (7) Kansas Agricultural College, exhibit of cereals and forage crops and root systems of plants; (8) Kansas Agricultural College, collection of woods for post purposes, illustrating rate of growth; (9) Kentucky Station, exhibit of hemp; (10) Maine Station, freezing microtome, by W. M. Munson; (11) Maine Station, crossing and improvement of types of tomatoes and blueberries; (12) Michigan Agricultural College, materials showing instruction in domestic science; (13) University of Minnesota, courses of instruction in domestic science and sewing; (14) University of Missouri, influence of birth weight of animals on subsequent growth; (15) New Jersey Station, results of experiments on forage crops for dairy cows; (16) New Mexico Station, photographs and charts showing benefits from arsenical sprays for codling moth, and the number of broods; (17) Cornell University, poultry breeding for egg production, and trap nests; (18) North Carolina Station, specimens and charts illustrating feeding value of cotton-seed products; (19) Ohio State University, apparatus instruction in for soils; (20) Rhode Island Station, photographs illustrating life habits of the apple maggot; (21) Utah Station, model of irrigation farm, and model vegetation house; (22) Utah Station, centrifugal apparatus for mechanical analysis of soils; (23) Vermont Station, charts illustrating composition and comparative value of silage, and analyses of butter produced on different rations; (24) Vermont Station, maple-sugar making; (25) University of Wisconsin, soil aspirator and apparatus for determining relative rates of flow of air through soils of different texture and structure; (26) Wisconsin University, instruction and investigation in drainage and irrigation; (27) Wisconsin Station, feeding value of corn by-products.

Bronze medals.—(1) Section of home economics, in charge of Maude Gilchrist, collective exhibit illustrating courses of instruction in home economics, with samples of students' work; (2) section of rural economy, in charge of F. W. Card, collection illustrating courses of study in rural economics; (3) Clemson Agricultural College, exhibit of evaporated sweet potatoes; (4) Connecticut State Station, specimens of plant diseases; (5) Connecticut Storrs Station, effect of cleanliness of milking, by

[a] This award subsequently raised to grand prize.

At the head of the staff is R. B. Greig, professor of agriculture, economic science, and engineering field work. In addition to the instruction given in the college it is planned to establish "if possible research stations or experimental farms."

Smith Agricultural School.—According to a note in the *Amherst Record*, at the coming city election in Northhampton, Mass., the city will be called upon to elect three persons who shall serve as "superintendents" of the "Smith Agricultural School," to be established with funds bequeathed under the will of the late Oliver Smith. Oliver Smith died in 1845, leaving $30,000 for the establishment of "a model farm and an experimental farm where worthy young men could make a study of agriculture in its various branches, and also a school where a young man could be trained in mechanics." Under the terms of the will the fund was to be allowed to accumulate for 60 years, and will therefore become available next year, when it will amount to approximately $300,000. It is stated that the provisions of the will are not so specific as to prevent considerable latitude on the part of those charged with the execution of the bequest. The general character of the school will therefore depend quite largely upon the "superintendents" who are elected.

New Agricultural Institution in Canada.—Sir William C. Macdonald, of Montreal, who has taken a deep interest in rural education and recently contributed funds for the establishment of concentration schools as an experiment, has decided to establish the Macdonald Foundation for Rural Education in Ste. Anne de Bellevue, 20 miles west of Montreal. A site of about 700 acres of first-class land, with fine exposure overlooking the Ottawa River, has been purchased. Prof. James W. Robertson, Commissioner of Agriculture and Dairying of the Dominion Government, will be at the head of the new institution.

It is proposed to have three departments, i. e., of research, of instruction, and of farms. The department of research will comprise research work in the sciences as related to agricultural and horticultural operations and to rural life generally. The department of instruction will provide long and short courses, and will furnish a headquarters for advanced education bearing upon rural life in Canada. In addition to carrying on work along lines somewhat similar to those followed at the best colleges of agriculture, there will be a division of household science, provision for special courses in nature study for teachers of rural schools, and a division of manual training.

The department of farms will provided for (1) a dairy farm, (2) a meat producing farm, and (3) a "small cultures" farm. Each of these will be arranged, equipped, stocked, manned, and managed so as to illustrate the best known systems and methods of profitable agriculture. Within each farm there will be a series of small farms of from 1 to 5 acres. Apprentices will be received and, in addition to the general work of the larger farms, will be given charge of these small farms for actual practice work. These small practice farms are an outgrowth of experience with school gardens at rural schools, where a plat is assigned to each child.

The main buildings will be constructed in a fireproof manner, and will include residences for men and women students. The whole expense of establishing this institution will be borne by Sir William Macdonald, who will also endow it.

Butter Control Stations in the Netherlands.—A recent publication of the Agricultural Department of the Netherlands describes the butter control stations, which have lately been established by agricultural societies and dairy associations, under the general supervision of the provincial governments. These stations are designed to keep down the adulteration of butter, and to protect honest manufacturers and dealers by exercising control over their products and issuing a guarantee of purity. There are at present seven of these control stations and another is being organized. At the head of each station is a chemist as director, with as many analysts as may be necessary and one or more inspectors. These inspectors take samples of the butter and all materials used in its manufacture in the butter factories or sales rooms

which have submitted to the control. This inspection is extended to butter sent out by these manufacturers or merchants, and the control may also include a guarantee as to water content as well as purity of ingredients. The government regulations provide for the use of a stamp upon the product of the factories or sales rooms which have placed themselves under the control of these stations, which is equivalent to a "mark of guarantee." Paper stamped with this guarantee is to be obtained under certain conditions, and penalties are provided for the use of this guarantee except on a product which has been produced or sold under the control of the stations.

Elementary Agriculture.—Elementary agriculture and horticulture are being introduced into the public school at Westbury Station, N. Y. This school has an enrollment of 250 pupils, and the faculty of 7 teachers has been selected with a view of securing those familiar with manual training methods and school garden work. The school grounds, which contained originally over 70 shade trees, have been planted with about 80 shrubs, 50 vines, and 500 herbaceous plants.

The Territorial Board of Education of Oklahoma is preparing a course of study to be used in the rural schools, and is planning "to give such a place as is wise and practicable to instruction in agricultural education in these schools."

Course of Lectures on Poultry Raising.—A "Poultry School," including lectures and practical demonstrations on profitable poultry raising, has been inaugurated by the Young Men's Christian Association of Brockton, Mass. The course includes seven lectures, and is given as a part of the educational work of that association. Among the lecturers are Dr. A. A. Brigham, of the Columbia School of Poultry Culture, and Dr. Cooper Curtice, of the Rhode Island College and Station. "The course is planned to fit the needs of all who keep fowl, whether the number be large or small, and will, therefore, be of interest to women as well as men, young people or those further along in years."

American Forest Congress.—A call has been issued for an American Forest Congress to be held in Washington, January 2–6, 1905, under the auspices of the American Forestry Association. The purpose of this congress is to establish a broader understanding of the forest in its relation to the great industries depending upon it; to advance the conservative use of forest resources for both present and future needs of these industries, and to stimulate and unite all efforts to perpetuate the forest as a permanent resource of the nation. The subjects to be considered, each of which will receive attention of a separate session, are as follows: (1) Relation of the public forest lands to irrigation; (2) relation of the public forest lands to grazing; (3) the lumber industry and the forest; (4) importance of the public forest lands to mining; (5) forestry in relation to railroad supplies; (6) national forest policy, and (7) State forest policy. The president of the congress is the Hon. James Wilson, and the secretary of the committee of arrangements is Mr. William L. Hall, Atlantic Building, Washington, D. C. The President of the United States will address the congress at a special meeting to be held in the Lafayette Theater, and will receive the delegates in a body at the New Year's reception at the White House. The congress will include delegates from a large number of organizations and bodies representing interests related to forestry, but all who are interested in the ends which it aims to secure are urged to attend the meetings.

Conference of Horticulturists.—A national conference of officers and workers of State horticultural societies was held in the rooms of the Palace of Horticulture on the Exposition Grounds at St. Louis, October 26. The purpose of the conference was the organization of a society which should have the business end of the horticultural interests of the State and Nation in view. A permanent organization was effected, and an executive committee appointed to formulate a constitution and by-laws for the society, to arrange a programme, and to fix upon a date and place for the next meeting. It was suggested that the society meet in a body with the American Pomological Society at its biennial convention, and this suggestion met with general approval.

Miscellaneous.—Announcement is made of a cooperative study of the peony by the horticultural department of Cornell University and the American Peony Society. A study will be made of all the varieties of peonies that it is possible to secure at the present time. The study will extend over a sufficient period of years to enable the investigators to cover the nomenclature, botany, and culture of this flower.

We learn from *Science* that Henry S. Graves, director of the Yale School of Forestry, has been commissioned by the Bureau of Forestry to undertake inspection work in the Philippines, and will also undertake commissions in India for the Forestry Bureau in the Philippines. He left New York December 3, and will return early in May. During the winter his courses will be conducted by Dr. Bernhard E. Fernow, formerly director of the Cornell School of Forestry.

At a meeting of the governors of the Southeastern Agricultural College at Wye, held on Monday, October 24, it was decided, according to *Nature*, to develop further the forestry department, for which a grant will be sought from the Board of Agriculture.

C. D. Howe, assistant in botany in the University of Chicago, has been appointed instructor in botany in the Biltmore Forest School, Biltmore, N. C., and will begin his new duties on January 1.

A department of agricultural-chemical technology has been established in the Polytechnicum at Budapest, and Dr. Thomas Kosutány, director of the Chemical Central Station and the Chemical Agricultural Institute, has been placed in charge of the new department.

Prof. Dr. Franz Tangl, professor of physiological chemistry at the University of Budapest and one of the leading European investigators in the physiology of animal nutrition, has been appointed professor of physiology at the University of Innsbruck.

Dr. K. Windisch, of Berlin, has been appointed director of the agricultural institute at Hohenheim.

Among the honors conferred by King Edward on the occasion of his last birthday was that of Companion of the Order of Saint Michael and Saint George (C. M. G) upon Francis Watts, director of agriculture in the Island of Antigua and agricultural chemist for the Colony of the Leeward Islands.

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EXPERIMENT STATION RECORD.

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The winter meeting of the American Association for the Advancement of Science has become one of the leading scientific events of the year. The association is so broad in its scope and its affiliations that it furnishes a common meeting ground for the representatives of almost every branch of pure and applied science. It brings together an enthusiastic and earnest body of men of science, who take advantage of this opportunity for meeting their colleagues and those engaged in related branches of science, of listening to papers and discussions on subjects of broad interest, and of enjoying the social features which are always in evidence at these meetings.

The meeting at Philadelphia last month was a representative one in all respects. It was attended by nearly a thousand persons, who were members either of the American Association itself or some of its affiliated societies. Both from a scientific and a social standpoint it was an eminently successful and satisfactory meeting.

Agricultural science was well represented at the various meetings of the botanists, the chemists, the economic entomologists, the Society for the Promotion of Agricultural Science, and the Society for Horticultural Science. The programs of several other sections and societies also contained a considerable number of papers relating to various branches of agricultural science, and even the address of the retiring president dealt in part with agricultural development in its relation to economic problems. The theme of President Wright's address was Science and Economics, and it concerned itself with the influence of science in modifying and extending the theories of economists, and what science might do in working out the great laws of the business world.

Concerning the Malthusian doctrine, it was pointed out that the author of the theory "did not anticipate and could not foresee the great changes which would come in the way of the cultivation of the land and in other ways to increase the food supply relative to the increase of population. . . . The broadening of the area of supply through discovery, and the taking up of vast tracts of land, were the immediate means of depriving the doctrine of its force, but later on intensive agriculture and the discoveries of science succeeded in relegating the theory to the past."

Closely allied to this doctrine is the law of diminishing returns, which, although it is fundamental and all-embracing, is usually applied to the agricultural industry. The speaker pointed out that through the introduction of machinery and the application of new principles in agriculture, science has greatly extended and regulated agricultural production and has modified the law of diminishing returns "to such a degree as, for a while at least, to rob it of its peculiar influence in increasing cost or retarding the supply from the cultivation of certain kinds of land."

In connection with the labor question stress was laid upon the relation of food to the efficiency of labor, and the speaker laid down the principle that the economy of food must be treated from two standpoints—the physiological and the pecuniary. "These elements can not be separated," he said, "if we are to understand fully the effects of different foods upon the efficiency of labor and the capacity of labor to sustain itself. These things should form a part of political economy; they are certainly far more valuable than any treatise upon rent or interest." The conviction was expressed that the various agencies now at work under the patronage of the Government, scientific institutions, colleges, and universities will furnish a body of facts that will clearly and definitely decide the great question of efficiency of labor so far as food is concerned.

The Philadelphia meeting marked the twenty-fifth anniversary of the Society for the Promotion of Agricultural Science, which was established by a body of men who felt the need of an organization where the methods and results of agricultural experimentation might be discussed. In his presidential address this year Dr. William Frear briefly reviewed the development of agricultural science in various directions, which began with chemistry and was later extended to physics and biology, and called attention to the necessity for cooperation between the different branches of science in extending the boundaries of knowledge relating to the science of agriculture. The calls upon the investigators are becoming more numerous, and the problems presented to them are increasingly complicated, so that we now recognize that they must be approached from various points of view.

Referring to the practical character of American investigation in many lines, rather than its being conspicuously scientific, the speaker stated that this condition was reflected in our schemes for agricultural education, which have laid special stress upon the art. He made an appeal for greater attention to science as the foundation of the art, and said in conclusion: "Modern agricultural education will fail unless the science is made to keep equal pace with the art, both in our schools and in our experiment stations. The art of the future must depend upon the science of the future, as well as upon that of to-day, and the

science of the future must develop not only from the demands of the practitioner of the art, but from the productive energies of the scientist."

The presidential address of Prof. L. H. Bailey before the Society for Horticultural Science dealt with the question, What is horticulture? In answering this he showed it to be primarily a biological subject whose fundamental relationship is with botany, although latterly it has been correlated with agriculture rather than with botany. Horticulture was compared in its relations to botany with that of electrical and other engineering to physics. It was suggested that the present tendency to return to unit courses of biology might result in the abandoning of the term "botanist" as designating the occupant of a professorship, and that in its place would be specialized biologists in various phases of the subject. Among these would be reckoned the horticulturist, connecting plant biology with the affairs of men. Going a step further, the speaker prophesied the differentiation of horticulture, as has been the case with agriculture, with horticulturists representing different branches of the industry, such as pomology, ornamental gardening, fruit manufacture, and the like.

The general subject of horticulture was divided into three phases—the biological or science side, the affairs or commercial side, and the art and home side. The speaker affirmed that the opportunities of horticulturists on the science side are just beginning to be recognized and that most of their work has been of a temporary and superficial character. Real horticultural research is only begun, and the field is concreting itself and attracting trained men to it. Out of this more profound research of the future, it was suggested, might come a clearer conception of plant breeding and its relations to the grower and to the manipulation of the soil, a new plant physiology, preferably a joint product of the botanists and the horticulturists, and important contributions to the subject of evolution, derived inevitably from study of the species which we now cultivate and the extension of effort to species not yet domesticated.

In addition to the horticulturist's biological work, the speaker pointed out his mission in cultivating the art impulses, as expressed in plants in the home and in the garden, in the parks, and along the streets and highways. His energies are expended in every way in which plants appeal to men. As a teaching profession the subject was divided into two great phases—the teaching of those things relating to the art and the craft, and aiding in bringing the child into relations with its environment. "In all these generations," he said, "we have been training the reflective and passive faculties; we shall now train also the creative and active faculties. . . . The child will be trained to use his hands, to plan, and to reason from actual problems. Then he will be resourceful and will have power."

A résumé of the papers of agricultural interest which were presented at the meeting of the American Association will be given in the next issue. Many of these will naturally be published in full in various scientific journals. Indeed, even to many persons who attended the meeting the published form will often prove quite as profitable, especially in the case of papers presented in much detail. In a large meeting of this sort, where so much has to be crowded into three or four days, delegates are satiated with papers and fatigued, so that they are compelled to select those of more special interest to them, and for the rest can only carry away certain generalizations. With the multiplicity of organs which we now have for the publication of scientific papers, there is less excuse than formerly for the presentation of progress reports in the ordinary lines of research or upon relatively narrow subjects, whose publication in a scientific periodical would serve every purpose. At all events, the presentation of such subjects should be brief and confined to a summary of the findings which have a bearing on the general progress of investigation.

It has frequently been suggested that the time of the meetings might well be reserved for papers presenting some new features of a subject of widespread interest, or involving principles in the progress of the science, or conferences or discussions on some topics in which an exchange of views by selected speakers would help to illuminate the subjects and suggest points where the evidence needed strengthening. A case in point is the annual discussion of the American Society of Naturalists, which always forms an interesting feature of the American Association meeting. These discussions are participated in by a number of men selected beforehand, and representing different branches of science or different points of view.

This year the subject of the discussion before that society was The Mutation Theory of Organic Evolution, which was treated from the botanical, cytological, anatomical, and paleontological standpoints, and also from that of animal breeding. Such an exchange of views can hardly fail to be instructive and helpful, and the oral presentation by prepared speakers lends an added interest.

We are prone to multiply scientific organizations and to subdivide into specialties, but in doing so much of the advantage of contact with men representing the more general aspects of science is lost. Too close specialization in work and in association tends to narrowness, and the failure of the investigator to consider his own work and that of others in their broad relations endangers the accuracy of his generalizations.

Already there is a revulsion against so large a number of independent societies, and we find a movement toward a union of common interests or the holding of joint sessions. At the meeting last month

the botanists took steps toward a union of their interests, now represented by three societies which meet simultaneously, into a single organization to be known as the Botanical Society of America.

Too great specialization is one of the dangers of the younger workers in applied science, and there have been some evidences of this in the forces of the experiment stations. The station men are often, by reason of their location and the character of their duties, to a certain degree isolated and cut off from the opportunity for contact with men in their respective lines. To them quite as much as the worker in pure science the broadening influence and the stimulus which come from association with men of science in their own and related lines is important, and tends to higher and better work. It is gratifying, therefore, to note the attendance of station men at these meetings in increasing numbers, and to find them occupying a prominent place in their respective sections or affiliated societies.

The social or contact side is undoubtedly one of the most helpful features of these meetings, for it not only enables men of science to come to know one another better, but it extends scientific affiliations and promotes the scientific spirit so essential to all investigation.

In the retirement of Dr. W. C. Stubbs from the directorship of the Louisiana Experiment Stations, the South loses one of its strongest and most successful workers in the domain of agricultural experimentation. One of the pioneers in this work, he combined with his scientific attainments an aggressiveness and a knowledge of practical affairs which made him a capable organizer, a forceful administrative officer, and an exceptionally efficient and influential investigator.

For twenty years past he has given his best efforts to upbuilding the agriculture of the State and placing its leading industry upon a more scientific basis. The multiplicity of duties imposed upon him have kept him constantly overworked and greatly restricted him in the higher investigation which was close to his heart. Like many another man in this field, he was sacrificed to the demands of to-day, as a result of the high appreciation and confidence in which he was held; and it was largely due to his indomitable energy and physical strength that he was able to accomplish as much as he did in agricultural science. The desire for more leisure for writing and study is given as the reason for his decision to retire thus early in life, while still in full health and vigor.

The regret at Dr. Stubbs' retirement will not be confined to the State where he served, but will be shared by the surrounding States which felt his influence, and by his colleagues in experiment-station work throughout the country. The latter will miss his inspiration and counsels, and will hope that his interest in the field of work where he has been so conspicuous will not soon be relinquished.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

E. W. ALLEN, Ph. D.,
Office of Experiment Stations.

The eighteenth annual convention of this association, held at Des Moines, Iowa, November 1–3, was one of the most interesting and profitable meetings which this association has held for many years. It was the first meeting under the new constitution, which reduces the number of sections from five to two, and the advantage of the new plan was very marked in enabling delegates to follow the discussions more closely and in concentrating the deliberations upon questions relating to the administration of the colleges and stations, the general management, and methods of work. An appeal for the formation of a division for horticulture and botany within the section on station work was rejected, and it was made apparent that, inasmuch as the object of these meetings is not the presentation of technical papers reporting specific investigations, but rather the discussion of broad questions of station work and administration and the methods by which these can be made most effectual, there is a distinct advantage in the compact organization. About 150 delegates and visitors were registered.

GENERAL SESSIONS.

The general sessions were presided over by Dr. W. O. Thompson, of the University of Ohio. He delivered the presidential address on the evening of the first day, taking for his theme Some Problems in the Colleges of Agriculture and Mechanic Arts. In this, Dr. Thompson pointed out that the Morrill Act is the original foundation upon which these colleges stand, and it was not expected that the Morrill funds would support the institutions, but that the States would aid in their support. The expenditure of money must inevitably increase, for civilization makes increasing demands upon the citizens—it presents not only its opportunities but its duties as well.

The colleges and stations were shown to stand in a very vital relation to our natural resources, and to their development and preservation; and it was pointed out that they are not for the farming people exclusively, although they will reach them first, but that they have a deeper significance for the whole country. In estimating the full measure of the college and station work it was urged that we must look beyond the mere material results, and consider their influence in its highest sense,

which is the effect on men, in giving them higher ideals of life; and these ideals should become the common property of all the people.

Coming to some of the practical problems of the colleges and stations, attention was called to the conditions in the agricultural communities, the tendency away from the farm, and the fact that many a farmer's boy lacks the opportunity for individual initiative so essential for independent positions. It was urged that farm life must not be the refuge of necessity, and that not all farmers' sons are suited to be farmers any more than all lawyers' sons are suited to that profession. The changes in farm life were noted, such as increased cost of machinery, the labor problem, and the requirement in most localities not only of more capital but of greater intelligence and native ability. Impoverished farm land was pointed to as one of the greatest drawbacks to development. This tends to keep down the price of labor, harbors an inferior population, and threatens the most important conditions of rural life.

The point was made that intelligent operation of the farm is now necessary for any margin of profit. The fallacy that unintelligent men can make successful farmers or satisfactory farm laborers was severely arraigned, and it was urged that a much lower grade of intelligence is required to dig a sewer ditch in the city than a ditch for tile draining on the farm, because farm work "requires men who are equal to their own emergencies and who can assume their own responsibilities." It should be recognized that intelligence on the farm will produce results just as surely as elsewhere; and some manifestations of the tendency toward more intelligent farming were cited.

Conceding that the time is past for unintelligent farming in most parts of this country—that farming requires an education, the problem of how to supply this need was declared to be the problem of agricultural education; and here the point was made that the enterprise is usually working under the disadvantage of too little money. It is not generally appreciated that agricultural education must necessarily be a very expensive form of education. "The agricultural college is an expensive thing in itself, because it centralizes all the expensiveness of ignorance under an organization that proposes to remove ignorance and supplant it with intelligence and skill." The need of ample funds for this branch of education was enlarged upon, and it was pointed out that the limitations of the colleges have been a very serious handicap to the development of agricultural education in this country.

Coming to elementary instruction, a strong plea was made for the introduction of agriculture in the rural schools, and the duty devolving upon the agricultural colleges of furnishing the inspiration and the initiative for this movement was pointed out. Agriculture differs from other industries in that it will not take care of itself, like banking or engineering, and hence a propaganda must be carried on for it. An

extension department of the college was advocated to work up and stimulate agricultural education in the rural communities. "The problem of agricultural education will not be solved until the agricultural colleges have been brought into close and vital relations to the agricultural populations."

The report of the executive committee, submitted by Dr. H. C. White, chairman, described the efforts of the committee in behalf of the "mining bill" and the bill for the further endowment of experiment stations, now pending in Congress, and the conferences of the committee with the Secretary of Agriculture and a committee of the Department on matters relating to cooperation with the stations.

Regarding cooperation, no concrete conclusion had been reached, but it was thought that much had been accomplished in the direction of a mutual understanding, and the continuance of these conferences was recommended. In order that Congress may be advised of the character and importance of the work which the stations are doing, it was recommended that the executive committee be authorized to appear before the agricultural committees of Congress and explain these matters.

This topic came up for consideration at a later session, in connection with the report of the committee on cooperation, by President E. A. Bryan, and a resolution introduced by Dr. W. H. Jordan, was adopted as follows:

Resolved, That this association emphatically recognizes the great services which the National Department of Agriculture is now rendering to the science and practice of agriculture, and to the institutions here represented, by its helpful cooperation with the agricultural experiment stations, and by its able coordination and wide dissemination of the information secured within itself and by the experiment stations; and this association views with disfavor any movements which, either by legislation or otherwise, shall tend to disturb or lessen the mutually advantageous relations which now exist between the Department of Agriculture and the experiment stations of the several States.

Resolved, That this association is firmly of the opinion that the continuation and development of these mutually helpful relations between the Department and the stations, and the maintenance and progress of efficient research in agricultural science, demand that the autonomy and paramount position of the stations as institutions of research and experimentation be inviolably maintained within their respective States, in accordance with the terms and spirit of the Hatch Act.

Resolved, That in order that Congress may be properly informed as to the work of the agricultural experiment stations and its great value to agricultural practice, and to promote satisfactory relations between the Department of Agriculture and the experiment stations, the executive committee of this association is hereby instructed to request a hearing before the proper committees of Congress for the purpose of presenting the work and claims of the agricultural experiment stations, and to continue conferences with the honorable Secretary of Agriculture relative to cooperation between his Department and the stations.

The discussion of this resolution was carried on with the utmost frankness and good feeling, and with full confidence that a way would be found which would prevent any apparent antagonism or duplication.

The report of the treasurer, Dr. E. B. Voorhees, showed total receipts (including balance on hand) of $1,794.26, and expenditures amounting to $1,160.34, leaving a balance in the treasury of $633.92.

The report of the bibliographer, Dr. A. C. True, enumerated some of the notable works and bibliographies relating to agricultural science which had appeared during the year; and the report of the committee on indexing agricultural literature mentioned especially the card index to periodicals relating to agricultural science, which is being prepared in the Library of this Department.

The committee on the collective college and station exhibit at St. Louis, through Dr. W. H. Jordan, chairman, presented a progress report briefly enumerating some of the features relating to the exhibit in the Palace of Education, and the "outside exhibit," demonstrating the methods of work with plants and animals. A summary of the awards was presented, which have already been enumerated in this journal (E. S. R., 16, p. 414). There was some discussion as to the final disposition of the report, but no definite action was taken, and authority was given the committee to close the exhibit.

The committee on uniform fertilizer and feeding stuff laws submitted a brief report, through Dr. H. J. Wheeler, chairman. It reaffirmed its recommendation of last year, that in the case of feeding stuffs the State should make direct appropriation for defraying the expense of the inspection. Upon the point referred to the committee as to whether the results of fertilizer analysis should be reported in terms of ammonia or nitrogen, phosphoric acid or phosphorus, potash or potassium, the committee reported that in view of the fact that many of the States had passed laws using the words ammonia, phosphoric acid, and potash, and as these terms had become fixed, the change to nitrogen, potassium, and phosphorus was impracticable. There was shown to be considerable lack of uniformity at present, and it was stated that the Association of Official Agricultural Chemists has a committee considering the question of nomenclature. In view of this fact a committee on chemical nomenclature was appointed by the chairman of the section of station work, to confer with the similar committee of the Association of Official Agricultural Chemists. The committee appointed consists of C. G. Hopkins, H. J. Wheeler, A. T. Neale, R. J. Davidson, and H. Snyder.

The committee on methods of seed testing reported, through the chairman Dr. E. H. Jenkins, that during the year the rules for seed testing had been revised and printed as a bulletin of this Office.

The committee on military instruction in land-grant colleges submitted a brief report through President G. W. Atherton, which was

referred to the section for college work, as this subject was upon the programme of that section (see below).

The committee on methods of teaching agriculture presented a report on The Teaching of Agriculture in the Rural Common Schools. This reviewed the development of industrial training in the common schools, the movement to introduce agriculture into rural schools, and the various forms which this work has taken; discussed some obstacles in the way, the object of teaching agriculture, and concluded with a syllabus of an elementary course in agriculture.[a]

The report of the committee on graduate study reaffirmed the plan of conducting a graduate school under the auspices of the association, and recommended that the school be held in future every two years, beginning, if possible, with the coming summer, that each agricultural college be requested to contribute a small sum of money, say $25, to aid the maintenance of such a school, and that the committee be empowered to arrange for the holding of such schools. This report was adopted.

The report of the committee on rural engineering, presented by Dr. W. E. Stone, chairman, reported the progress which has been made during the year in developing courses in agricultural engineering and farm mechanics. Courses in these subjects are now offered by the agricultural colleges of California, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, New York, North Dakota, Wisconsin, and Wyoming. Some examples of the benefits of instruction and investigation carried on by these departments were presented. The report recognized it as exceedingly important at this time that a bureau or division of agricultural engineering be organized in this Department, to aid the colleges which now have courses in agricultural engineering, to collect the data which such colleges are obtaining in their experimental tests, to carry on original research, and to establish laboratories for practical tests of implements, etc.

Prof. W. M. Hays presented the report of the committee on animal and plant breeding, which described the formation of the American Breeders' Association, now numbering 275 members, 15 of whom are life members.

In a scholarly address on The Social Phase of Agricultural Education, President Kenyon L. Butterfield laid down the broad proposition that "the permanent function of the agricultural college is to serve as a social organ or agency of first importance, in helping to solve all phases of the rural problem."

The introduction of rural economics and the spirit which it stands for was stated to be far more than the adding of three or four subjects of study to the agricultural course, but to involve the very function

[a] Since issued as Circular 60 of this Office.

and policy of the college itself. "The whole spirit and method of the agricultural college must be 'socialized.'" The first requisite to this was indicated to be the conscious ideal or purpose of being "all things to all farmers," and the second, organization. The greatest need of American agriculture to-day was declared to be social leadership, and it was argued that the college should train men and women for this service. Finally, "to carry out the function of the agricultural college, we need a vast enlargement of extension work among farmers. This work will not only be dignified by a standing in the college coordinate with research and the teaching of students, but it will rank as a distinct department with a faculty of men whose chief business is to teach the people who can not come to the college."

Director William Saunders of the Central Experimental Farm, Ottawa, Canada, delivered an address on The Upbuilding of Agriculture. In this address the speaker treated of the development of colleges of agriculture and experiment stations, and the great work of the United States Department of Agriculture. Coming to the work in Canada, he described the various agencies at work there and noted many of the profitable results of the experimental work in Canada and British Columbia, paying special attention to the introduction and improvement of cereals by selection and breeding.

President James K. Patterson, representing a committee appointed for that purpose, presented an eloquent tribute to the late Major Henry E. Alvord, recording the high esteem and affection in which he was held by the association, and testifying to his eminent services to agriculture in the various public and private capacities in which he served. "A sincere friend, a patriot, a soldier without sectional bitterness or prejudice, an efficient administrative officer, and a wise counselor, with a lofty ideal of duty and of honor, this association discharges a duty to itself by bearing hearty testimony to his conspicuous worth as a citizen and as a man."

Resolutions were passed by the association tendering to the Hon. H. C. Adams and Hon. F. W. Mondell the hearty thanks of the association for their earnest, intelligent, and well-directed efforts in behalf of the bill for increasing the appropriation to the experiment stations and the "mining bill," and pledging the hearty cooperation and assistance of the association. By another resolution the executive committee was authorized to use its efforts to secure the passage of these bills and to give precedence in this to Mr. Adams's bill.

Resolutions instructing the executive committee to endeavor to secure the franking privilege for engineering experiment stations and for the extension departments of the colleges were discussed at considerable length, but were finally withdrawn, as action was not deemed expedient at this time.

An invitation was received for the association to hold its next meeting at Portland during the Lewis and Clarke Exposition.

The association adjourned after the morning session of the third day and proceeded by special train to the State College at Ames, where a most interesting and profitable afternoon was spent in looking over the buildings and equipment of this institution, especially its agricultural and engineering departments. Here the large amount of live stock kept primarily for instruction purposes—over 30 head of horses of various breeds and types, the new pavilion for stock and grain judging, the well-equipped new department of farm mechanics, the commodious soils laboratory, the new dairy building in process of construction, and the plans for the new agricultural building to cost from $250,000 to $300,000, typified the rapid advance which is making in the material equipment for agricultural education, which will place that department on a par with engineering at the better institutions.

The officers elected for the ensuing year were as follows:

President, E. B. Voorhees, of New Jersey; vice-presidents, J. C. Hardy of Mississippi, K. L. Butterfield of Rhode Island, C. D. Woods of Maine, E. R. Nichols of Kansas, and E. Davenport of Illinois; secretary and treasurer, J. L. Hills, of Vermont; bibliographer, A. C. True, of Washington, D. C.; executive committee, H. C. White of Georgia, J. L. Snyder of Michigan, W. H. Jordan of New York, C. F. Curtiss of Iowa, and L. H. Bailey of New York.

Section on college work and administration.—Chairman, R. W. Stimson, of Connecticut; secretary, K. L. Butterfield, of Rhode Island.

Section on experiment station work.—Chairman, H. J. Patterson, of Maryland; secretary, M. A. Scovell, of Kentucky.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

The question as to how far the land-grant institutions may or should engage in teaching elementary subjects not generally recognized as belonging to the college curriculum was discussed at length, and brought out a quite marked difference of opinion. The discussion was opened by a paper on this subject by President W. O. Thompson, who defended and justified those colleges of agriculture which have found it necessary to begin their elementary instruction quite low down, owing to lack of proper training in the public schools, and also commended the short courses. From the standpoint of the Morrill acts, he assumed that this elementary instruction was quite within the limits of the law, and granting this, he held that the manner of the teaching was wholly a matter of local jurisdiction.

In discussing this paper, President R. H. Jesse took the opposite ground, and maintained that the use of Federal funds for secondary education was a misappropriation, since the money was given for collegiate instruction. He disapproved of the establishment of agricul-

tural high schools or preparatory departments for the agricultural colleges, and contended that the remedy for the condition lay in the improvement of the public school system by the introduction of agricultural studies. "In Missouri we are risking our entire future on that doctrine, that the college of agriculture is going to rest on the public high school, and we are going to make the public high school agricultural as far as it ought to be agricultural." This was acknowledged to be the long way, but it was held to be the right way, which would justify itself in the long run.

Prof. L. H. Bailey took a middle ground upon this question, holding that these forms of elementary instruction are entirely warrantable under the Morrill Act, but that short courses do not properly belong in the college and are a temporary expediency, arising from the fact that the land-grant colleges do not articulate with the common schools. He did not advocate duplicating the system of public high schools, but believed the final issue would be to prepare the public schools to prepare for the land-grant colleges, as they now prepare for colleges of arts and sciences. But as this will occupy many years, perhaps a generation, he believed that we must take care of the pressing problems of to-day, and on that ground defended the short and lower-grade courses as temporary expedients. Dean Davenport, of the University of Illinois, explained the plan adopted at his institution, which is to cut away from the rigid courses of instruction leading to graduation, and lower the grade for admission, allowing greater freedom in the matter of electives. He stated that he had abandoned for the time being the high ideals advocated by some, and was endeavoring to demonstrate the practical utility and value of agricultural instruction and to create a demand for it.

Other speakers presented the local difficulty of confining the instruction to a four-year course, and maintained that the short courses had first roused genuine interest and confidence in agricultural education, and that the more elementary grades of work did not obscure the college course. It was held that under present conditions there is a large body of young men who are not and can not be prepared to enter the regular college course, with its rigid requirements for admission, and that for these young men, who come to the college in increasing numbers, special and short courses should be provided.

Closely related to this discussion was the consideration of the question, What Can and Should be Done to Increase the Interest in and Appreciation for the Agricultural Side of Technical Training? The subject was introduced by a paper by President J. L. Snyder, of Michigan, which led to a very animated discussion extending to the whole field of agricultural education.

President Snyder urged that the courses in agriculture must be technical, and that the agricultural department must have equal advan-

tage in equipment and buildings with the other departments of the college or university. He held it to be "the plain and imperative duty of all land-grant colleges to build up strong, independent departments of agriculture." Short courses should be provided for those unable to take the longer courses. The speaker described what was done in Michigan to arouse interest in the agricultural work by maintaining close relations with public schools, advertising the institution in various ways, and running excursions to the college in August, which the past year were attended by about eight thousand people.

Dean Davenport, referring to the one-time idea that agriculture could not be made interesting, suggested the need of more instructors in the subject, and splitting it up into smaller subdivisions. He showed, as a matter of statistics, that in different institutions the number of teachers in agriculture varies at present from 23 or 24 down to two-thirds of a man, and stated that "so far as I know, in these institutions the interest in agriculture on the part of the students is about in proportion to the number of men who are teaching the subject." Referring to the University of Illinois, he stated that the institution offers 73 different lines of instruction in agriculture, all technical, 67 of which are being taught this year; the present year its corps of instructors is giving 44,360 hours of instruction.

He made the point clear that the number of men to be taught should not be the unit in manning the staff of the agricultural department, as it now too often is, but that the true unit is the subject itself. He pointed out that his institution now has more teachers in agriculture than it had students five years ago, when the contention was that more teachers were not needed until there were more students to teach; but he showed that as soon as the number of instructors was doubled the number of students doubled, and he believed that within certain limits it would be so everywhere. He held that it was in the universities to-day that agriculture has the best opportunity, because its courses are more elastic and more opportunities are given for electives; and agriculture being a technical work, he argued, must be largely elective.

Prof. C. F. Curtiss urged concentration in the agricultural courses, rather than too narrow specialization; and other speakers pointed out the distinction between training and education, maintaining that much of the instruction given in agriculture was training simply, and did not involve systematic and fundamental instruction over a broad field, which is essential to education.

While the question as to what the colleges should do to popularize agricultural education was not definitely answered, the discussion served to clarify the ideas on this topic, to some extent, and to bring out the varying conditions in different localities which called for special treatment.

In a paper on What Degrees should be Given for the Completion of

Undergraduate Courses in Land-Grant Colleges? President G. A. Harter advocated the B. S. degree, to be placed on the same level as the B. A. degree in the requirements leading to it. He maintained that the degrees B. Agr. and B. S. A. (bachelor of science in agriculture) should be done away with, and that the tendency to multiply degrees should be resisted. Dr. A. B. Storms contended for the B. S. A. degree for agricultural students as being more definite; while others maintained that that degree recognized the agricultural work as professional, and that distinction should be made between the general academic degrees and professional degrees.

The question as to the intent and purpose of the Morrill Act in regard to military instruction was introduced by a paper by President M. H. Buckham, of Vermont, which traced the history of the incorporation of the military clause in the Morrill Act, and presented such documentary evidence as is to be found relative to the intent and purpose at the time the Act was passed. The special interest in this topic has grown out of General Order 65, issued by the War Department, which prescribes the amount of military instruction which the officers detailed to the colleges for this duty are expected to require. Through failure to comply with these requirements, several institutions have incurred an unfavorable report, which has resulted in the withdrawal of the detail. President Buckham suggested that less emphasis be placed on the manual and technical branches of military training, and more upon the higher, the intellectual topics in the military art, since the students at these land-grant colleges "take military tactics as a part of a liberal education, not to fit them to serve as enlisted men."

The quite lengthy discussion upon this topic showed that with the general advocacy of the importance of military work, and the desire to comply with the law in this respect, there was a quite general dissent from the present requirements of the War Department; and the presidents of several large institutions stated that if full compliance with General Order 65 were insisted upon they should be under the necessity of declining a detail and making provision for carrying out the military instruction in their own way.

A resolution introduced by President Van Hise, of Wisconsin, instructed the executive committee to present the views of the association to the President or the Secretary of War, and this resolution was later passed by the association at one of the general sessions.

SECTION ON EXPERIMENT STATION WORK.

This section considered the general subject of the breeding and improvement of plants and animals, and held a conference on the question of the amount of teaching which it is desirable for station workers to do.

Under the general subject Prof. W. M. Hays, of Minnesota, presented a paper on The Shakespeare of the Species. He pointed out the development of knowledge regarding methods of breeding plants and animals and the working out of some of the underlying principles. A very optimistic view was taken as to the importance of systematic work in breeding, in which there is already widespread interest, and it was believed to have great application in commercial lines. In discussing this paper, the influence of environment—altitude, climate, character of the soil, etc.—was brought out, and the statement made that "the energies of environment are to be considered as important factors, as great perhaps as that of heredity;" and from this it was argued that breeding work should be done in different localities, and species and varieties for these environments developed.

Dr. T. L. Lyon, of Nebraska, spoke upon Improvement in the Quality of Wheat, describing his extensive experiments in selection for protein and gluten. He stated that selection for improvement has not gone hand in hand with selection for yield, because the methods have not been perfected. Analyses of the different heads or spikes showed great differences in nitrogen, so that an analysis of any one head could not be taken as indicating the composition of the plant. Half the number of heads on the plant give a quite close average. There was a slight decrease in the number of kernels in the head and in the weight of the kernels, accompanying an increase in the percentage of nitrogen. The percentage of nitrogen is not a guide to the content of gliadin and glutenin, and if selection is to be made on the basis of gluten content the gliadin and glutenin must be determined. Tables showed that the gluten nitrogen varied from 0.48 to 2.94 per cent. The gluten was found to increase and decrease without change in its quality, since the relation of gliadin to glutenin remained about the same.

Dr. Lyon showed that selection had an effect the first year, as shown by the progeny; and a tendency toward heredity was apparent in the weight of the kernel, the same as in the case of nitrogen content. Since a high yield and high nitrogen content do not go together, it was pointed out that there is danger that in selecting wheat for yield alone the quality will be injured, and it was maintained, therefore, that the quality should be taken account of in breeding or selecting for yield.

Prof. H. Snyder called attention to the difference in values of wheat for various purposes and the lack of standards, and moved the appointment of a standing committee of three on standards for determining the value of cereals. This motion passed, and H. Snyder, C. G. Hopkins, and T. L. Lyon were appointed on the committee.

In a paper on Animal Breeding, Prof. C. F. Curtiss reviewed the work which is now being undertaken in animal breeding. The replies to a circular letter sent out to station men asking about the breeding

work and plans under consideration showed that considerable work in animal breeding has been undertaken, and that the subject is one in which there is much interest. Professor Curtiss expressed the view that the theories and supposed laws of heredity should be tested by extensive and repeated experiments with domestic animals, and that it is desirable to perform this work with the larger rather than the smaller animals, notwithstanding the longer time and greater expenditure which will be involved.

In the conference upon the subject of how much teaching, if any, it is desirable that a station worker should do, there was a lively discussion and a free expression of views, which seemed to be very largely in one direction. In opening the discussion Dr. H. P. Armsby showed that, according to the latest reports of this Office, about 54 per cent of the station workers now do more or less teaching, and that while the proportion differed in different institutions, the tendency seemed to be toward an increase in the number of station men who also teach. He expressed doubt as to the advantage, which is frequently urged, of the station men doing college work, and he was quite emphatic upon the point that while a certain amount of teaching might be advantageous "an uncertain amount is not." He believed that in this agricultural work a man should be chiefly either a teacher or an investigator, and maintained that the two kinds of work call for a different attitude of mind and the use of a different set of faculties, to a certain extent. He held it to be imperative, if the station enterprise is to reach the highest measure of success, that there should be a reform, and that the tendency should be in the direction of less teaching and a differentiation between the station and the school or college of agriculture, in order that the station may be just what the Hatch Act calls for—a department of the college devoted to research.

Dr. W. H. Jordan made the point that the advantage of teaching to the station man depended quite largely upon the kind of teaching to be done, and stated that most of the teaching at our agricultural colleges was the teaching of fundamentals. He denied that the teaching of fundamentals and the drilling of classes for 50 per cent of the time is an advantage to the investigator. He conceded that a small amount of teaching of an advanced character, along specialties with which the station man is dealing, say 10 to 20 lectures a year, might well prove an advantage; but he maintained that "very much of the teaching which we necessarily do in our agricultural colleges to-day is not an advantage but a disadvantage to the investigator."

It developed from the discussion that the plan of requiring this dual service from station men was considered largely one of expediency; and that being the case, it was urged that the teaching should be so arranged on the college schedule as to interfere as little as possible with the time of the station man, and to leave him a part of the year,

or possibly several days each week, entirely free from college work. The advantage to the teacher of carrying on some investigation was pointed out and conceded, but this is obviously another phase of the question. The almost unanimous opinion of the speakers was that the matter has been overdone, and that the general character of the station work has been unfavorably affected by the requirements of too much teaching from men holding important positions on the station staff.

The matter of federating the farmers' organizations and societies in the different States was brought up, and it was shown how these federations have been able to assist the colleges and stations in bringing about an appreciation of their work and in securing favorable legislation. A committee consisting of H. J. Wheeler, C. D. Woods, and H. J. Patterson was appointed to take up the matter in the different States by correspondence.

The programme committee recommended for next year the subject of soil investigations, and the discussion of the question of the extent to which demonstration work should be undertaken by the stations.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The chemistry of proteids, O. COHNHEIM (*Chemie der Eiweisskörper. Brunswick: Friedrich Vieweg & Son, 1904, 2. ed., pp. XII+315*).—The present edition, the author states, has been rewritten and revised, a large amount of new material being added. In its present form it constitutes a summary of available data regarding the chemistry, properties, and structure of proteid bodies, including albumoses and peptones, proteid salts, halogen derivatives and similar bodies, true albumins, proteids, and albuminoids. The numerous references cited throughout the volume constitute an extended bibliography of the subject. A copious index is provided.

The chemistry of wheat gluten, G. G. NASMITH (*Trans. Canad. Inst., 7 (1904), III, No. 15, pp. 497-516*).—Practically the same as a paper abstracted from another source (E. S. R., 15, p. 748).

Concerning isocreatin and its identity with creatin, E. POULSSON (*Arch. Expr. Path. u. Pharmakol., 51 (1904), No. 2-3, pp. 227-238; abs. in Zentbl. Physiol., 18 (1904), No. 13, p. 377*).—According to the author the yellow material which has been called isocreatin is a mixture of creatin with a yellow coloring matter, being identical with creatin in all of its reactions when freed from the coloring matter.

Concerning the estimation of nuclein bases in beet juice, H. W. BRESLER (*Ztschr. Physiol. Chem., 41 (1904), No. 6, pp. 535-541*).—According to the author's investigations the nitrogen of beet juice was made up of 0.29 per cent heteroxanthin, 1.58 per cent guanin, 0.81 per cent xanthin, 0.61 per cent adenin, 0.91 per cent hypoxanthin, and 0.69 per cent carnin nitrogen. The total nitrogen present was 0.2345 gm. per liter.

Methods suitable for the preparation of organic bases from plant juices and plant extracts, E. SCHULZE (*Landw. Vers. Stat., 59 (1904), No. 5-6, pp. 344-354*).—Methods and reagents are described which the author has found valuable in studying the organic bases of plants.

Gravimetric determination of phosphoric acid, J. SEBELIEN (*Pharmacia, 1904, No. 7, pp. 1-10*).—A discussion of the different gravimetric methods for the determination of phosphoric acid, with special reference to the methods proposed by Woy (E. S. R., 9, p. 321) and von Lorenz (E. S. R., 13, p. 14), both of which the author finds promising, especially the former method.—F. W. WOLL.

Estimation of potassium, D. SIDERSKY (*Ann. Chim. Analyt., 9 (1904), pp. 207-209; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 502, II, p. 589*).—For technical purposes Fresenius's method is recommended, although it is claimed that Schloesing's perchlorate method also gives trustworthy results. It is stated that in the first method 1 gm. of the platinum double salt represents 0.3056 gm. of potassium chlorid, in the second 1 gm. of perchlorate represents 0.5382 gm. of potassium chlorid.

The detection of corn meal in bread, D. OTTOLENGHI (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 189-193*).—According to the author the most satisfactory method of detecting corn meal in bread is by means of tests for maisin, a

characteristic proteid of maize discovered by Donard and Labbé (E. S. R., 14, p. 738). The technique of the method proposed is described.

The determination of boric acid in cider, fruits, etc., A. H. ALLEN and A. R. TANKARD (*Analyst, 29 (1904), No. 343, pp. 301–304*).—To learn something of the natural occurrence of borax, examinations of a number of samples of apples and other fruits, cider, and apple juice were made. The amounts of boric acid in the fruits examined ranged from 0.004 per cent in grapes to 0.016 per cent in quince and one of the pears examined. In cider and apple juice the range was from 0.004 gm. to 0.017 gm. per 100 cc. The analytical methods followed are described.

Further contributions to the Gottlieb and Adams methods of fat determination, L. F. ROSENGREN, (*Nord. Mejeri Tidn., 19 (1904), No. 22, pp. 291, 292*).—The author corroborates Barthel's findings as to the comparative results obtained by the two methods of determinations of fat in skim milk, and shows that the insoluble substance obtained in the Gottlieb method is not identical with Storch's membrane slime, but is essentially lecithin. The higher results obtained in the analysis of milk by the Gottlieb method are not, therefore, explained on the hypothesis that a portion of the membrane slime is dissolved by the ether-benzine mixture and renders the fat obtained in the Gottlieb method impure, as suggested by Storch.—F. W. WOLL.

On the determination of fat in cheese, M. SIEGFELD (*Milch Ztg., 33 (1904), No. 19, pp. 289–292*).—Five different methods of determining the percentage of fat in full-cream and skim-milk cheese were compared—extraction with anhydrous ether, the Schmidt-Bondzynski, substitution of sulphuric for hydrochloric acid in the Schmidt-Bondzynski method, the Gottlieb, and Gerber methods. Several of the methods were modified to some extent by the author in making the analyses.

The results of the comparative analyses indicate that duplicate determinations by any one of the methods, as well as the average results obtained by different methods, in general, agree quite well. In the case of skim-milk cheese the extraction method gave too low results, and difficulty was sometimes experienced with both the Gerber and the Gottlieb methods. The Schmidt-Bondzynski HCl method modified by Ratzlaff[a] is preferred by the author.—F. W. WOLL.

Micro-chemical detection of sugars by means of phenylhydrazin acetate, E. SENFT (*Monatsh. Chem., 25 (1904), pp. 397–421; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 502, II, p. 595*).—According to the author, sugars are best detected under the microscope in the form of their osazones, prepared according to the method described by the adding to phenylhydrazin acetate in glyceron, the sugar it is desired to test.

The hydrolytic products of sugar-cane fiber, C. A. BROWNE, Jr. (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1221–1235, pl. 1*).—The fact that sugar-cane bagasse is being utilized for paper making has led to renewed interest in the chemical composition of the sugar-cane fiber. The author notes that the tissues of the sugar cane resemble very closely those of maize, sorghum, and many other monocotyledonous plants. The different layers of the cane were separated, analyzed, and extended studies made of the carbohydrates of sugar-cane fiber.

The author concludes that when pure this fiber (excluding protein, fat, ash, etc.) consists approximately of cellulose, including oxycellulose 55 per cent, xylan 20 per cent, araban 4 per cent, lignin 15 per cent, and acetic acid 6 per cent. The fiber of sugar cane, it is pointed out, resembles very closely in composition the pithy stalks of maize, both being allied to the cereal straws. The formation of pentosans physiologically from modifications of cellulose, and related topics are spoken of.

"The various substances into which woody fiber may be resolved by hydrolysis have led many to believe that we are dealing with more or less of a mechanical mixture—a substratum of cellulose overlaid with 'incrusting substances.' This view,

[a] Milch Ztg., 32 (1903), No. 5, p. 65.

however, is no longer tenable. The cellulose, pentosans, lignin, and acetic acid obtained from cane fiber are all hydration products, which in the parent substances, are intimately combined. While, therefore, a study of the groups split off by hydrolysis is our chiefest aid in investigating the problems of constitution, the mistake must not be committed of regarding the products obtained by chemical treatment as absolutely identical with fiber constituents."

The origin and formation of honey, and its relation to the polariscope, W. A. Selser (*Amer. Jour. Pharm., 76 (1904), No. 6, pp. 267–271*).—The formation of honey by the bee is discussed and the results are reported of studies with the polariscope of a number of samples of honey gathered in the western and southwestern United States with the object of securing data for the detection of adulterated honey.

Determining the alcohol content of wine by means of its flashing point, P. N. Raikow and P. Schtarbanow (*Chem. Ztg., 28 (1904), No. 76, pp. 886–888*).—The author studied the flashing point of wine as a method for determining its alcohol content and compared this with other methods. The discrepancies observed were attributed to the presence of volatile compounds other than alcohol. Suggestions are given regarding the interpretation of the results obtained by the flashing-point method.

The fatty oil of strawberries, I. Aparin (*Zhur. Russ. Fiz. Khim. Obshch., 36 (1904), pp. 581–596; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 502, II, p. 583*).—According to the author's determinations, strawberry oil had a specific gravity of 0.9345 at 15° and normal atmospheric pressure; at 25° it was 1.4790. The saponification number was 193.7; the acid number 6.41; the Reichert-Meissl number 2.1; Hubl's iodin number 180.3. The oil contained 88.2 per cent insoluble fatty acids having an iodin number of 192.3. Linoleic acid, about 81 per cent, linolenic acid, about 10.5 per cent, and oleic acid were the principal acids present.

Investigations of linseed oil and methods of protection of wood and iron, 1899–1903 (*Copenhagen, 1903, pp. 107*).—A preliminary report, issued by the Danish State Technical Testing Laboratory, on methods of examination of linseed oil, and on the value of methods of preservation of wood and iron by means of coal tar, oil varnishes, and paints of different kinds.—F. W. WOLL.

Extract from the flowers of iris as a sensitive indicator, A. Ossendovski (*Zhur. Russ. Fiz. Khim. Obshch., 35 (1903), p. 845; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, p. 132*).—The author tested for its qualities as an indicator an extract prepared from the petals of the Japanese iris, and found that it affords the possibility of distinguishing mineral from organic acids, and mineral from organic alkalis. Besides, the change of the color in neutralization takes place gradually, passing a series of clearly distinguishable tones, which render this extract especially serviceable.—P. FIREMAN.

The occurrence of aluminium in vegetable products, animal products, and natural waters, C. F. Langworthy and P. T. Austen (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. V + 168*).—"The material included in this contribution to the bibliography of aluminium deals only with the occurrence of this element in vegetable products, animal products, natural waters, and a few miscellaneous materials, such as edible earths. The general purpose has been to include only reference to such articles as report separate determinations of aluminium or some of its salts, and to omit the very large number in which iron and aluminium are reported together."

The brief notes accompanying the references give the percentages of aluminium reported in the different cases.

"No attempt has been made to comment on the value of individual analyses cited, as the object of the bibliography was the collection of data rather than the critical examination of them." The bibliography contains 671 references to reports on the

occurrence of aluminium in the various products named. The use of the book is facilitated by a detailed index.

On the presence of normal formaldehyde in the products of combustion and in smoke, A. TRILLAT (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 25, pp. 1613–1615*).

The spectro-photometric determination of small quantities of carbon monoxid in the air, L. DE SAINT-MARTIN (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 1, pp. 46–49, fig. 1*).

An evaporimeter, A. MITSCHERLICH (*Landw. Vers. Stat., 60 (1904), p. 63*).—This consists of a clay cell such as is used in electric batteries kept saturated from within. The advantage claimed for this apparatus is that it is not affected by rain and other weather conditions and so may be used in the open.

BOTANY.

Report of the botanist, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1903, pp. 461–554, pls. 13*).—A considerable portion of the report of the botanist is taken up with experiments in plant breeding, which are noted elsewhere (p. 464). A brief account is given of experiments with fungicides, which has already been noted (E. S. R., 15, p. 274).

The distribution of asparagus rust throughout the United States, as indicated by correspondence with botanists of the different experiment stations, is shown. Examination of the plats of asparagus cultivated at the station showed the presence of the rust during the late autumn and at no time was it very severe in its attack. An inspection of the plants in November showed only traces of the disease upon the varieties Palmetto and Argenteuil, while other varieties were affected to an extent of about 10 per cent. This is quite a reduction in the amount of injury over the previous seasons, when from 20 to 75 per cent of the plants were injured.

Studies on the powdery mildews of the United States are given, showing their distribution, classification, development, etc., and special notes are given on the powdery mildews affecting the various economic plants. Remedies for their control are noted, and attention called to a statement in a previous publication (E. S. R., 15, p. 274) on the value of kerosene emulsion for the prevention of powdery mildews on hothouse-grown plants.

In an experiment in which plants were sprayed at intervals of about 1 week with water in which copper filings had been kept for some time, the sprayed plants were less attacked by the powdery mildew at the end of the experiment than check plants grown under otherwise similar conditions. The paper on the mildews concludes with a list of the species and their distribution throughout the United States, together with their host plants and a bibliography of publications relating to them.

In continuation of the previous report (E. S. R., 15, p. 161), the authors report on fungi as related to weather, the season covered by the report having been one especially suited to the development of certain fungi. In addition to mentioning the occurrence of certain diseases, notes are given on the mildew of Lima beans, the rotting of potatoes, tomato diseases, diseases of the pear orchard, etc., and the report concludes with a record of temperatures for the past 15 years.

On the change of the albuminoid substances in moldy fodders, M. F. IVANOV (*Collection Works Kharkov Vet. Inst., 6, pp. 1–85; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 2, pp. 263, 264*).—This is a series of investigations carried on under the direction of Prof. S. A. Ivanov, on the effect produced on fodders by various molds.

In the first series of experiments *Penicillium glaucum* and an unknown brown mold were grown on flour obtained from Hungarian and Zhelanni oats. When the molds were grown on the Hungarian oats, which have a low nitrogen content, nitrogen was

assimilated from the air. In the molding of the Zhelanni oats, with a higher nitrogen content, a decrease was noted in the total nitrogen. In general, the total nitrogen of the albuminoid substances decreased during the period of molding. At first the *P. glaucum*, growing on the Hungarian oats, resulted in a considerable increase in albuminoids, but after about 2 weeks this form of nitrogen diminished and the nitrogen of the amido acids and that precipitated by phosphotungstic acid increased. The nitrogen present in alcoholic extracts was found to increase during the entire period of moldy growth. This is held to be of great importance, as in these extracts are present poisonous substances possessing some of the properties of plant alkaloids.

In the second series of experiments *Aspergillus niger* was grown on flour obtained from carrots, turnips, and potatoes. An increase in the total nitrogen was noticed in the case of the carrots and turnips, but not of the potatoes. A considerable increase of albuminoids took place at the expense of the nitrogen of the amido acids and that precipitated by the phosphotungstic acid, the maximum taking place in about 12 days, after which the albuminoids were destroyed and the other nitrogenous compounds augmented. The alcoholic extract from molded tubers gradually decreased. The artificial addition of glucose and starch to molding tubers would not affect the total nitrogen.

The author undertook the study of the products of decomposition, and found among the decomposition products of albuminoids under the development of *A. niger* on the seeds of yellow lupines an inconsiderable quantity of tyrosin and larger quantities of leucin and ammonia, the latter combined with oxalic acid. Tests for arginin and histidin gave negative results.—P. FIREMAN.

Notes on the mycorrhiza of forest trees and their symbiosis with roots, G. F. C. SARAUW (*Rev. Mycol., 25 (1903), No. 100, pp. 157–172; 26 (1904), No. 101, pp. 1–19, pl. 1; abs. in Bot. Centbl., 95 (1904), Nos. 6–7, pp. 159, 160; 20, pp. 539, 540*).—In continuation of a previous paper (E. S. R., 4, p. 693), the author summarizes his investigations and incorporates some recent information regarding the occurrence and function of mycorrhiza on the roots of forest trees and shrubs.

Forest trees are divided into 3 categories based upon the nature of their mycorrhiza—those having intracellular mycelium, such as cedrus, box, elms, and maples; intercellular mycelium, and an external mycelial sheath, as spruce, fir, larch, pines, oaks, hazels, birches, willows, and possibly linden; and those having neither internal nor external mycelium, as the ash, horse-chestnut, elder, etc. The common juniper is said to have an intracellular mycelium in the second group, but is without the mycelial sheath.

In the second part of the contribution the author gives a report on the biological importance of mycorrhiza and a study of the biology of the fungus symbiont. The opinions of Frank and others regarding the importance of mycorrhiza are reviewed, and it is claimed that Frank's experiments with forest seed in sterilized soil lacked some important factors of control. The present author holds that humus in the soil is necessary only in determining the abundance of mycorrhiza, and cites the infrequence of such growths in garden soils often rich in humus, while mycorrhiza may be and often is abundant in trees growing in shifting sands.

The presence of mycorrhiza in very sandy soils is said to be due to dead leaves which carry the different fungi capable of infecting tree roots. The question of nitrogen absorption through the mycorrhiza and roots the author claims has not been proved. It is claimed that trees have become accustomed to symbiosis with fungi, but it is held to be neither necessary nor advantageous to them. The infection takes place through vegetable débris carrying the fungi and the fungi live a sort of saprophytic life in the soil. From a limited study of the various organisms, the author claims to have recognized conidial types corresponding to Cladosporium and Helminthosporium, and he believes that the fungi which produce mycorrhiza belong

to the group Spheriaceæ. It is considered doubtful whether truffles, puffballs, etc., can form mycorrhiza.

The decomposition of dead leaves in the forest, E. HENRY (*Ann. Sci. Agron., 2. ser., 1902-3, II, No. 3, pp. 328-333*).—The author found that in the case of leaves placed in zinc boxes, or brought in contact with zinc salts, the action of the bacteria causing decomposition of the leaves was greatly checked. When compared with the same leaves under normal conditions the decomposition was reduced about half during the first year. In some cases only about 15 per cent decomposition took place within a year. Leaves of some species were found to decompose much more rapidly than others, and the leaves of the hornbeam, although much less coreaceous and containing much less tannin than oak leaves, are not decomposed as rapidly as the oak leaves when submitted to normal conditions.

Fixation of the atmospheric nitrogen by dead leaves in forests, E. HENRY (*Ann. Sci. Agron., 2. ser., 1902-3, II, Nos. 2, pp. 313-320; 3, pp. 321-327*).—The results of some recent experiments on the fixation of nitrogen by leaves are given, and the author concludes that dead leaves of the oak, beech, hornbeam, poplar, Austrian pine, and spruce are able, either alone or mixed with soil, when in a moist substratum, to fix considerable portions of nitrogen from the air. Leaves of pine, beech, and spruce placed in pure sand or in a poor dry soil were either unable to take up any atmospheric nitrogen to enrich the soil, as in the case of the beech, or to assimilate a very slight amount, as in the case of the leaves of pine and spruce. In none of his experiments was there any loss of nitrogen.

The enzym-secreting cells in seedlings of maize and dates, H. S. REED (*Ann. Bot., 18 (1904), No. 70, pp. 267-287, pl. 1*).—In continuation of the preliminary account previously noted (E. S. R., 15, p. 752), the author has studied the enzym-secreting cells of seedlings of *Zea mais* and *Phœnix dactylifera*. It was found that in the resting condition the secreting cells of both maize and dates are crowded with relatively small proteid granules. As secretion begins these granules gradually disappear. In maize the disappearance coincides closely with the consumption of the endosperm. In the date, however, the granules disappear long before the endosperm is dissolved.

The chromatin of the nuclei is small in amount at the beginning of secretion and increases as germination progresses. The nucleolus diminishes with the progression of germination. These changes are more noticeable in the case of maize than in the date. There is no evidence that solid matter is extruded from the nucleus. At the end of secretory activity the protoplasm of the secreting cells breaks down and the products of disintegration disappear from sight.

Studies on evaporation by purslane, E. B. WATSON (*Wallaces' Farmer, 29 (1904), No. 42, p. 1269*).—The results of experiments carried on at the Iowa Agricultural College, in which the effect of the growth of purslane on the temperature and moisture of the soil is shown. The weed grew in great abundance and practically covered small plats in the nursery and these were studied, comparisons being made with adjacent plats which were under cultivation. The effect of the purslane on the temperature of the soil is shown by the following table:

Table showing effect of purslane on soil temperature.

Depth.	Cultivated plat.	Purslane plat.	In favor purslane.
	Degrees F.	*Degrees F.*	*Degrees F.*
Surface	104.0	79.2	24.8
One and one-half inches	82.4	72.0	10.4
Three inches	77.7	68.9	8.8

From this table it is shown that while the surface soil of the cultivated plat had the highest temperature, the difference for the lower strata was less than for the surface. The moisture determinations are shown in the following table:

Table showing percentage of moisture in the 2 plats.

Depth.	Hoed plat.	Purslane plat.	In favor of hoed.
	Per cent.	*Per cent.*	*Per cent.*
Surface soil, first 7 inches	23.7	18.5	5.2
Subsurface, 7 to 21 inches	22.3	19.5	2.8

The results obtained in this determination show that when compared with the table showing the temperature, in spite of the fact of the purslane-covered plats being cooler, there was a decided decrease in the amount of moisture in the soil and subsoil. The author has calculated the amount of water evaporated by the purslane over that evaporated from the cultivated soil and found that it amounted to almost exactly one inch during the time of the experiment, which was limited to 12 days.

Some metabolism products of peas attacked by Aspergillus niger, J. Kosjatschenko (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *1903, No. 4, pp. 439–450; abs. in Bot. Centbl., 95 (1904), No. 22, p. 590*).—The author has investigated the metabolism products of proteids in peas when attacked by *Aspergillus niger*. After 64 days' cultivation of the fungus on ground pea meal, the author found present tyrosin, leucin, ammonia, histidin, arginin, and lysin.

FERMENTATION—BACTERIOLOGY.

Experiments on the transformation and fixation of nitrogen by bacteria, J. G. Lipman (*New Jersey Stas. Rpt. 1903, pp. 217–285, pls. 2*).—A report is given of investigations made to determine the behavior of bacterial mixtures, as they are found in fresh soils, in nitrogen-rich and in nitrogen-poor solutions; to determine what gains or losses of nitrogen may occur, and to study isolation in pure culture and physiological and morphological characteristics of nitrogen-fixing bacteria. Considerable attention is given to methods of isolation, and the conditions under which fixation by atmospheric nitrogen may be accomplished in the laboratory. A number of nitrogen-fixing organisms were isolated in pure cultures and the results of studies made with them are given in detail.

The author isolated a species of Azotobacter from soil which showed marked capabilities of assimilation of nitrogen. These organisms were found to occur abundantly in certain soils of the State, and the organism as shown by its cultural characteristics is described. The name *A. vinelandii* has been given it. In connection with studies of this organism others were isolated, especially species of Bacillus, some of which seem to be closely associated with the Azotobacter. It is believed that one species, *Bacillus 30*, exists in symbiosis with *A. vinelandii*, and inoculation experiments showed a decided increase in the amount of nitrogen fixed where the two organisms are used in conjunction. Each species was found capable of assimilating and fixing atmospheric nitrogen when grown separately in culture media, but when grown together the amount of nitrogen fixed was increased many-fold.

A contribution to the study of fermentation, I, E. H. Twight and C. S. Ash (*California Sta. Bul. 159, pp. 26, figs. 16*).—An account is given of cooperative investigations between the California Station and the California Wine Association, in which a study was made of the influence of temperature and of acidity of must on fermentation, the influence of selected cultivated yeasts as compared with the natural or wild yeasts, and the comparative value of wines derived from these experiments.

The observations recorded were made on 360 fermentations in tanks of 5,000 gal. capacity each, making a total of 1,250,000 gal. of wine, which, it is believed, will put the work on a practical basis.

It was found in the fermentation of wine that the temperature varied from 60 to 105° F., with an optimum temperature of about 85° F. When wine was fermented at a much higher temperature the amount of sugar reduced was depreciated and the amount of acetic, lactic, and other acids increased, with a depreciation in the amount of alcohol. Fermentation at 85° F. or lower results in a reduced amount of volatile acids and albuminoids, and an increase in the percentage of alcohol and dryness. Experiments with the cultivated yeasts showed that fermentation was more regular and more rapid with the cultivated forms than with those naturally occurring on the fruit. The period of fermentation was about the same for both, and the temperature at which the best fermentation took place was the same.

Investigations were carried on to determine the effect of the addition of sulphurous acid or sulphites to white wine, the theory upon which their use was based being that the chemical will stop the natural fermentation, leaving a comparatively clean must to be drawn off. This must is then inoculated with pure cultivated yeasts which have been developed so as to produce fermentation in the presence of a considerable percentage of sulphurous acid. So far as the investigations have been carried the results obtained are believed to be very satisfactory.

METEOROLOGY—CLIMATOLOGY.

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1904, No. 1, pp. 30, pls. 5, figs. 2*).—This is a summary of observations on the meteorological conditions of the winter of 1903–4 in the lake region, with notes on the opening of the navigation season of 1904, ice during the winter of 1903–4 at different points on the Great Lakes, display of storm signals on the lakes, and lists of observation and storm-warning stations.

Meteorological observations, J. E. Ostrander and G. W. Patch (*Massachusetts Sta. Met. Buls. 187, 188, 189, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July, August, and September, 1904. The data are briefly discussed in general notes on the weather of each month.

Meteorological and magnetic observations at the observatory of the College of Belen, Havana, 1903, L. Gangioti (*Observaciones meteorologicas y magneticas hechas en el observatorio del Colegio de Belen, Habana, 1903. Havana: Colegio de Belen, 1904, pp. 74, charts 3*).—Detailed records and summaries of observations on pressure, temperature, tension of aqueous vapor, humidity, wind, evaporation, cloudiness, and rainfall are given for each day and for different hours of the day for each month of the year 1903. Casual phenomena and magnetic observations are also noted. The mean atmospheric pressure for the year was 762.19 mm. (29.725 in.), maximum 769.84 mm. (30.024 in.), minimum 755.73 mm. (29.473 in.); the mean temperature (shade) 24.8° C., maximum 32.7 (August 22), minimum 12.6 (December 4); the average relative humidity was 74.2; the total rainfall 1,311.9 mm. (51.06 in.).

Meteorology of the spring of 1904 (*Bul. Dir. Agr. et Com.* [*Tunis*], *9* (*1904*), *No. 32, pp. 464–475*).—A summary of observations at different places in Tunis on atmospheric pressure, temperature, cloudiness, etc., for the months of March, April, and May, 1904.

Invariability of our winter climate, W. B. Stockman (*U. S. Dept. Agr., Weather Bureau Doc. 312, pp. 5; reprint from Mo. Weather Rev., 32* (*1904*), *No. 5, pp. 224–226*).—Temperature data "covering a considerable period of years at a number of selected

stations, so distributed as to show the general conditions obtaining over the country generally east of the Mississippi Valley" are compiled and discussed. The places for which data are given are Fort Snelling, Minn.; Fort Leavenworth, Kans.; New Orleans, La.; Chicago, Ill.; Cincinnati and Cleveland, Ohio; New Bedford, Mass.; Washington, D. C.; and Charleston, S. C.; and the period covered runs back to 1854. "From a study of the departures given during the last past 50 years it will be seen that the contention that the winters of recent years are less rigorous than those of former years, at least so far as temperature is concerned, is not well founded."

Climate of Missouri (*The State of Missouri. Columbia: Missouri Commission to Louisiana Purchase Exposition, 1904, pp. 59–62, figs. 8*).—The more important climatic characteristics of the State are shown on maps and briefly discussed.

Rainfall in the agricultural districts, E. L. Fowles (*Queensland Agr. Jour., 15 (1904), No. 1, p. 517*).—A table shows the total rainfall for each month from May, 1903, to May, 1904, inclusive, in the agricultural districts of Queensland.

Weather forecasts from the humming of wires, R. DeC. Ward (*Science, n. ser., 20 (1904), No. 512, p. 540*).—A brief reference to a report of a study by F. Bock given in the August number of *Das Wetter*, in which certain rules for forecasting weather conditions based on observations on the humming of telegraph and telephone wires are laid down.

Fertility and frost, U. P. Hedrick (*Michigan Farmer, 46 (1904), No. 20, p. 358*).—Observations are recorded which go to show "that vegetation on a well-fertilized soil is better able to withstand frost than is that on a poor soil."

Destructive floods in the United States in 1903, E. C. Murphy (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 96, pp. 81, pls. 13, figs. 2*).

SOILS.

Geology of Oktibbeha County, Mississippi, W. N. Logan (*Bul. Mississippi Agr. and Mech. College, 1 (1904), No. 2, pp. 67, figs. 12, map 1*).—This survey, which was conducted under the auspices of the Agricultural and Mechanical College of Mississippi, includes studies of geography, hydrography, topography, physiography, archeology, and geology, with detailed discussions of the characteristic formations and economic deposits (sand, brick material, cement material, road metal, and phosphatic marl), and special articles on soils by W. L. Hutchinson, W. R. Perkins, and H. S. Chilton, forage plants and grasses by G. W. Herrick, and forestry and trucking lands by A. B. McKay. The chapter on soils describes the characteristic types, with physical and chemical analyses, and discusses their fertilizer requirements.

The relation of smelter smoke to Utah agriculture, J. A. Widtsoe (*Utah Sta. Bul. 88, pp. 147–179*).—This bulletin records the results of a careful and detailed study of the nature and extent of damage done to trees, orchards, crops, live stock, and soils by the smoke from copper smelters in or near the towns of Murray and Bingham Junction, some 5 to 7 miles south of Salt Lake City, Utah, as well as of the substances emitted by the smelters. The most noteworthy substance found in the smelter smoke was sulphur dioxid, which varied from 59 to 93 parts per 10,000 of air, according to the distance from the smelter ($1\frac{1}{4}$ to $\frac{1}{2}$ mile).

"The amount of solid particles carried by the air which had passed over the smelter chimneys was so small that it could not be investigated by any ordinary methods of analysis. To collect large quantities of the flue dust, special dust collectors were contrived and set up in various places near the smelters . . . Chemical examination showed these dust samples to contain a large quantity of iron, some copper, and traces of arsenic. In addition were numerous particles of soil dust. That this dust really came from the smelters was proved by the large quantity of magnetic particles found in the samples."

Summarizing the results, it is stated that "when the wind causes the smoke to

beat upon a field for a considerable length of time, it tends to injure the crops severely and thus to diminish their yields. It tends to injure animals that are right in the line of the prevailing winds, and therefore are compelled to breathe the smelter smoke in the air. It may occasionally poison pools of standing water, when the washing of rains and melting snows cause a concentration of the flue dust in low-lying places . . . It does not injure equally all land within any given radius. The injured fields are those in the paths of the prevailing winds. It does not injure the fertility of the soils of the district. It does not affect materially the feeding value of crops grown in the district."

Practical suggestions to farmers as to how to manage lands subject to injury by smelter smoke are made.

A new centrifugal soil elutriator, P. A. Yoder (*Utah Sta. Bul. 89, pp. 47, figs. 13*).—This bulletin refers briefly to the more important methods and apparatus for mechanical analysis which have been heretofore proposed, pointing out some of the disadvantages which most of them possess, and describes an apparatus combining the fundamental principles of the centrifugal and elutriator methods, which, it is claimed, enables the analyst "to make a good separation in a comparatively short time, using a relatively small volume of water, and securing at once each grade of particles except the fine clay, in a minimum of water, ready for drying and weighing."

In the apparatus described a special form of current elutriator is placed in suitable sockets in a centrifugal machine, and carefully balanced by means of an adjustable counterpoise. The muddy water resulting from the shaking up of a weighed sample of soil is run in a uniform stream through the machine, and by regulating the velocity of this stream or the rotary speed of the machine, it is possible to control the grade of particles which are separated.

A section of the centrifugal machine, with elutriator bottle and counterpoise in position, is shown in figure 6. An enlarged section of the elutriator bottle is shown in figure 7. This bottle is so designed as regards shape that a uniform force is exerted on the suspended soil particle in all parts of the bottle where separation takes place. By making the outline of the bottle a parabolic curve, with the diameter increasing as the axis of the machine is approached, it was found possible to maintain a uniform ratio between centrifugal force and the force exerted by the stream of water.

The machine is found most useful for separating particles less than 0.03 mm. in diameter, this fine material being most conveniently separated from the original sample of soil by gravity elutriation. The elutriator bottle receives the water containing the suspended soil through the funnel F, the axis of which coincides with the axis of the centrifugal machine. From this funnel the water is carried to the bottom of the bottle by means of a small tube. The overflow escapes through a larger tube concentric with this smaller tube through the neck of the elutriator bottle and is carried by a side tube T to a circular spray collector above. From this collector a delivery tube drains the liquid into a beaker.

The size of the particles which pass out of the machine suspended in water depends both upon the velocity of the stream of water and upon the speed of the machine. A uniform flow of the water containing the suspended soil particles is secured by allowing the water to flow from a closed funnel-shaped vessel only as fast as air is admitted from a larger closed bottle serving as an air chamber into which water flows from the Mariotte bottle placed above through a valve which can be regulated at will.

By a series of experiments the relations between the speed of the machine and the velocity of the current on the one hand and the size of the soil particles on the other were carefully worked out. From the data obtained diagrams are plotted and formulas are deduced for definitely determining these relations.

In the actual operation of the machine 10 gm. of soil is thoroughly disintegrated

by shaking or boiling for half a day or more. The soil is then rinsed into the narrower of a series of gravity elutriators (of the Schöne type), while a slow stream of water flows through to prevent the sediment from choking the tube. After all the soil has been transferred the stream is turned on to a velocity of nearly 37.09 cc. per minute. When the larger part of the fine material has been removed the current is turned on to the full strength of 37.09 cc. per minute required to separate particles of 0.0316 to 0.1 mm. in diameter. The overflow from the narrower elutriator passes

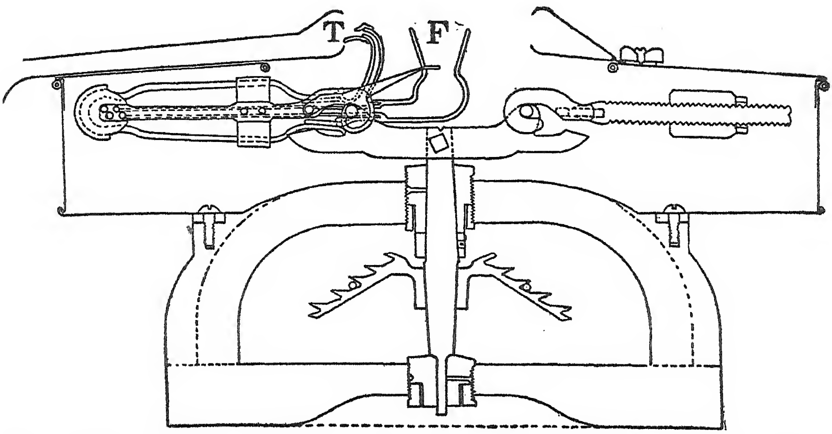

FIG. 6.—Yoder's centrifugal elutriator; vertical section. (From U. S. Dept. of Agr., Bureau of Soils Bul. 24.)

into the wider elutriator and thence into a beaker for further use in the centrifugal elutriator.

The first 300 to 600 cc. of the muddy water from the gravity elutriator containing nearly all the fine clay is collected, and while the gravity elutriation is being completed this water is run through the centrifugal elutriator at the speeds required for the separation of the finest grade (0.001 mm. particles), namely, with a current of 43.75 cc. per minute and a centrifuge speed of 1,888 revolutions per minute. The muddy water thus obtained contains most of the fine clay, a small portion being carried down to the bottom of the bottle with the coarser sediment. This sediment is

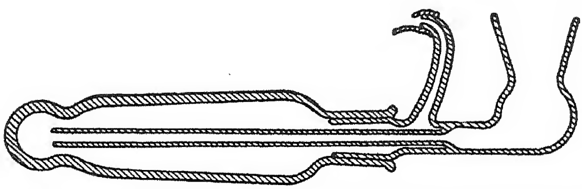

FIG. 7.—Centrifugal elutriator bottle; longitudinal section. (From U. S. Dept. of Agr., Bureau of Soils Bul. 24.)

thoroughly shaken up with more of the muddy water from the gravity elutriator and all is put through the machine at such a speed of centrifuge and water flow as will give a separation of the 0.01 mm. particles, namely, 91.46 cc. and 404 revolutions per minute.

When the muddy water has all passed through, followed by a little rinsing water, the machine is stopped. The sediment will be found to be so firmly imbedded in the bottom of the elutriator bottle that the muddy water can be poured off from it. The sediment is then shaken up in 150 to 200 cc. of clear water and run through the

machine at the same speed a second time. Thus freed from the finer grades it is transferred with a little clear water to a weighed dish and is dried and weighed as coarse silt. The muddy water from this elutriation is run through the machine at such speed of centrifuge and water current as will effect the separation of the next size of particles, 0.00316 mm., namely, 95.73 cc. and 1,148 revolutions per minute. The sediment is shaken up once and run through at the same speed, then collected and weighed as medium silt.

In a similar manner separation is made at the required speed of the fine silt, 0.001 mm. particles. The material remaining in suspension at the end of the process is precipitated by the addition of a solution of sodium chlorid (50 cc. of saturated brine to 1 liter of the water containing suspended material). After standing 4 hours, or better over night, the water is siphoned off, the sediment collected, dried, and weighed, and the salt in it determined volumetrically with silver nitrate solution (1 cc. equivalent to 0.01 gm. NaCl).

From the results of a series of tests of the apparatus under a variety of conditions the conclusion is drawn that "the advantages which the writer thinks should commend this new machine for the mechanical analysis of soils are the rapidity with which separations can be completed and the small sizes of grains which can be separated and estimated. Very great accuracy is not claimed for the method, and indeed such can hardly be claimed for any method yet proposed. It is the opinion of the writer that very great refinement in the determinations of the several grades of soil particles has but little value above that in determinations which are accurate within one or two per cent."

The effect of soil sterilization upon the development of plants, C. Schulze (*Jahresber. Ver. Vertreter Angew. Bot., 1 (1903), pp. 37–44; abs. in Bot. Centbl., 95 (1904), No. 22, p. 586*).—On account of the fact that many experiments are carried on in soil sterilized by heat, the author has investigated the effect of high temperatures on the soil compounds. It was found that a sterilizing temperature affects the decomposition products of some soils in a way that is detrimental to plant growth, in some of the experiments the plants proving exceedingly sensitive to the changes produced. On the other hand, sterilization of soil by heat results in the liberation of soil compounds, especially the insoluble nitrogen compounds, resulting in a greatly increased growth of the plant when compared with plants grown in normal soils.

An artificial root for inducing capillary movement of soil moisture, L. J. Briggs and A. G. McCall (*Science, n. ser., 20 (1904), No. 513, pp. 566–569*).—The apparatus here described was devised for the purpose of studying the rate at which a plant is able to secure water from a soil. It consists of a Pasteur-Chamberland filter tube connected by means of a short piece of lead tubing to a 2-liter bottle exhausted to pressure equal to the vapor pressure of water. The filter tube is buried in the soil which is to be studied, but preparatory to doing this "a core of soil is removed by means of a tube, the external diameter of which is equal to that of the smaller end of the porcelain tube. The filter tube is slightly conical in form, so that when it is forced into this hole a good capillary connection is established between the walls of the tube and the soil."

In the investigations reported "the apparatus was usually allowed to stand for about 24 hours, when the exhausted bottle was detached and the water which had been drawn into the apparatus removed and measured. The porcelain tube was not disturbed in removing the water, which was drawn into a small flask by suction through a fine tube extending to the bottom of the porcelain tube. The apparatus was then immediately put together again and exhausted by means of an aspirator.

"The water thus removed not only represents the amount of water which the soil has supplied to the tube during the preceding period of 24 hours, but it appears to be identical in concentration and composition with the soil solution from which the plant obtains its food. Therefore, the determination of the amount and composition

of its soluble material gives us at once the concentration and composition of the soil solution. The apparatus thus provides a simple means of studying the changes which take place in the solution from which plants obtain their mineral food. . . .

"The [average] rate of translocation of the soil moisture into the tube, at the beginning of the experiment [June 7–8], after a heavy rain, was 8.9 gm. per hour. It fell steadily during the next two weeks to about 1 gm. per hour. Heavy rains on July 1 brought the rate up to an average of 13.7 gm. per hour for the 24-hour period, after which it fell to 1.5 gm. per hour on July 7, and so on."

It is claimed that the studies made with this apparatus indicate that it provides "(1) a means of determining the rate at which water can be supplied by a soil to an artificial root, by means of which a capillary pull is exerted upon the soil moisture of any desired magnitude up to 1 kg. per square centimeter. This makes possible the comparison of rates of capillary movement in different soils under field conditions.

"(2) A simple method of removing a portion of soil moisture with the dissolved substances which it contains, thereby enabling a study of the concentration and composition of the soil solution under different field conditions.

"The apparatus has the disadvantage of being able to remove water from the soil only when the latter is comparatively moist; in other words, it fails to give information regarding the rate of movement of soil moisture during conditions approximating a drought. Experiments are now in progress with a view to extending the range of the apparatus."

An artificial root for inducing capillary movement of soil moisture, F. H. King (*Science, n. ser., 20 (1904), No. 516, pp. 680, 681*).—A note on the above article, which raises the question whether the evidence presented by the author "is sufficiently conclusive to warrant the views there expressed, or [whether] they have succeeded in devising an artificial root which, in any essential way, can be said to represent or measure the natural movement of soil moisture in a soil toward an active root."

It is pointed out that "even if the author's conclusions be not correct regarding the cause of the flow of water in the experiment, the line of investigation is important in that it has provided a means of securing water from field soils, perhaps, in a somewhat more concentrated condition than occurs in natural drainage, and permits the sample to be taken where its history may be very definitely known; and it is to be hoped that they and others will apply the method in investigating the character of soil extracts thus obtained." It is regarded as extremely doubtful, however, whether "either the concentration or the composition of solutions so procured will be found to be the same as that which closely invests the soil grains or the root hairs at the same place and time."

Soil moisture studies, C. H. Kyle (*Industrialist, 30 (1904), No. 35, pp. 567–580, fig. 1*).—This article gives the results of a study of the moisture conditions during the summer of 1903 in soil under different methods of culture and crop rotation.

"The method employed in determining the amount of moisture in the soil is the gravity method. Samples of the soil of the field or plat under experiment are taken in foot sections to the depth of 6 ft., and each sample, on being removed, is placed in a separate tray and covered at once, so as to prevent loss of moisture. In order to obtain an average sample four (duplicate) samples are usually taken, at some distance apart, of each of the first 2 ft. and two samples are taken of each of the remaining 4 ft., all samples for the same foot being placed in the same tray.

"These trays are made of heavy tin, with closely fitting lids of the same material. They are 12 in. long, 4 in. wide, and 3 in. deep. Each tray has a number stamped on its two sides, one end, and the lid, so that while in the field it is only necessary to keep a record of the foot from which the sample is taken and the number of the tray in which the sample is placed. Each tray on being filled is placed in a large, galvanized-iron chest or trunk, made for the purpose. Each chest holds sixteen trays. When all of the samples are secured the chests are carried to the laboratory

and each tray is carefully wiped with a cloth and then weighed upon a torsion balance, which weighs accurately to one-tenth of a gram. After removing the lids the trays are placed in a large drying oven, and there heated for from 18 to 24 hours, or until the temperature in the oven becomes reasonably constant at about 110° C., when the weighing is repeated, and from these two weighings and the weight of the tray the per cent of moisture is figured, with the dry weight of the soil used as a basis."

The variations in the moisture content of fall-plowed, spring-plowed, and unplowed land, and in soils under various crops and crop rotation, cultivated in different ways, especially as regards depth and frequency, were studied by this method. The results are reported in detail, but are somewhat inconclusive at this stage of the investigations.

The mechanical analysis of soils, J. G. McIntosh (*Chem. News, 90 (1904), No. 2333, p. 80*).—Tests of the methods of mechanical analysis of Nobel, Schloesing, and Masure are reported to show that they give very discordant results on the same sample of soil. The author claims that "the data afforded by a mere mechanical analysis of the soil tells nothing either to the chemist or farmer."

Micro-organisms of soil and human welfare, T. J. Burrill (*Science, n. ser., 20 (1904), No. 509, pp. 426–434*).—This is the presidential address read at the Buffalo meeting of the American Microscopical Society August 24, 1904, and briefly discusses the characteristics of soil micro-organisms and their relation to rock disintegration, nitrification, and fixation of nitrogen alone or in symbiosis with leguminous plants. The dependence of soil fertility and consequently man's prosperity and welfare upon the activities of soil organisms is emphasized.

The comparative nitrifying power of soils, S. F. Ashby (*Jour. Chem. Soc. [London], 85 (1904), No. 502, pp. 1158–1170*).—This is a preliminary report on investigations made with a view to finding a trustworthy method for comparing the activity of nitrification in different soils. The method employed in the studies here reported consisted in taking a large sample of soil at a constant depth, drying and pulverizing the sample to secure uniformity, seeding a very small quantity (0.2 gm.) in a dilute sterilized culture solution of constant depth, incubating at constant temperature until nitrification had made moderate progress in the least active solution, and calculating the results as parts per hundred of total nitrogen nitrified.

The results show that the method gave reasonably concordant nitrifying power in soil from different parts of the same field, that equal seedings from the same sample had similar nitrifying power, that the loss of nitrogen by denitrification and volatilization of ammonia during incubation was minimized, that the incubation period was about 30 days, and that a comparative nitrifying power was found in the soils tested which agreed with that which might be inferred from their known history.

Some essential soil changes produced by micro-organisms, S. F. Edwards (*Michigan Sta. Bul. 218, pp. 25–30, fig. 1*).—"The object of this bulletin is to review simply and briefly the present knowledge of soil bacteriology in its relation to agriculture with a view to emphasizing the close relationship between bacteriologic principles and the common operations of tilling the soil." It explains the conditions essential to bacterial activity and describes the processes of ammonification, denitrification, nitrification, and fixation of nitrogen, as well as other changes brought about in the soil by micro-organisms.

Soil management, E. W. Hilgard (*Science, n. ser., 20 (1904), No. 514, pp. 605–608*).—A review of three papers by F. H. King, published by the author with permission of the Secretary of Agriculture, and containing reports of investigations conducted while the author was connected with the Bureau of Soils of this Department.

A contribution to the study of the culture of alkali soils, A. Guyader (*Bul. Dir. Agr. et Com. [Tunis], 9 (1904), No. 32, pp. 451–461*).—A review of literature on this subject with applications to Tunisian conditions.

FERTILIZERS.

Investigations relative to the use of nitrogenous materials, E. B. Voorhees (*New Jersey Stas. Rpt. 1903, pp. 148–184*).—This is a report of progress in a series of investigations which has been carried on by the station for several years (E. S. R., 15, p. 128). The questions studied, the methods pursued, and the data recorded are of the same character as in previous investigations. The crop used in the experiments here reported was timothy.

The relative availability of the different nitrogenous fertilizing materials experimented with during the years 1898 to 1902 is summarized in the following table:

Relative availability of nitrogen in different fertilizing materials.

	Corn, 1898.	Oats, 1899.	Oats and millet, 1899.	Oats, 1900.	Oats and corn, 1900.	Wheat, 1901.	Timothy, 1902.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Nitrate of soda	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sulphate of ammonia	99.5	72.9	77.9	99.2	87.7	91.0	38.3 or 54.4
Dried blood	95.4	58.5	61.3	68.3	73.1	75.7	34.6 or 56.9
Solid manure, fresh	16.8	12.0	43.1	14.2	26.4	31.1	63.0
Solid manure, leached	37.9	12.1	46.4	9.7	22.0	24.4	56.1
Solid and liquid, fresh	49.7	58.2	88.4	40.1	51.5	30.8	47.2
Solid and liquid, leached	50.4	20.0	33.0	28.9	35.9	19.9	69.5

In these experiments the analytical study of thé nitrogen content of the crop has been supplemented by a study of the nitrogen content of the corresponding soils with a view to determining the income and outgo of nitrogen. The method of taking and treating the soil samples for the determination of nitrogen is described.

From the results obtained in these studies of the nitrogen content of the soil and of the plant the general conclusion is drawn "that the presence of soluble nitrogen compounds at the beginning of the season allows a more economical use of the soil nitrogen, and that nitrate is of greater value in this respect than any other form of nitrogen, because of its greater solubility and the greater ease, therefore, with which it diffuses through the soil."

The use of fertilizers; a review of the results of experiments with nitrate of soda, E. B. Voorhees (*New Jersey Stas. Rpt. 1903, pp. 185–214*).—A reprint of Bulletin 172 of the station (E. S. R., 16, p. 245).

Extraction and industrial treatment of Peruvian guano, E. Leplae (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 7–8, pp. 289–320, figs. 13*).—The origin of the guano deposits and the history of their exploitation are briefly reviewed. The decline of the industry due to exhaustion of the deposits and a recent revival of interest in the subject due to partial renewal of the deposits and improvement of methods of handling the material are also noted.

Sulphate of ammonia in agriculture, J. Graftiau (*Le sulfate d'ammoniaque en agriculture. Antwerp: Laporte & Dosse, 1904, pp. 79*).—A summary of information regarding the value and use of sulphate of ammonia as a source of nitrogen for different soils and crops. The author believes that when sulphate of ammonia is compared with nitrate of soda under all conditions it is not possible to draw general conclusions as to the superiority of one over the other, much less to establish a formula for their relative value.

Report of analyses of commercial fertilizers for the spring and fall of 1903, W. H. Jordan, L. L. Van Slyke, and W. H. Andrews (*New York State Sta. Bul. 252, pp. 191–268*).—The results of analyses of 540 different brands of fertilizers are reported. Of these, 377 were complete fertilizers in which the total nitrogen varied from 0.14 to 8.32 per cent, averaging 2.11 per cent; the water-soluble nitrogen from

0 to 8.91 per cent, averaging 1.02 per cent; the available phosphoric acid from 0.06 to 15.50 per cent, averaging 8.50 per cent; the potash from 0.03 to 13.33 per cent, averaging 4.78 per cent. In 62 out of the 377 brands examined the potash was in the form of sulphate free from excess of chlorids. The average amounts of nitrogen, available phosphoric acid, and potash exceeded the guaranteed averages by 0.07 per cent, 0.83 per cent, and 0.23 per cent, respectively. The average retail selling price of the fertilizers was $26.60; the retail cost of the separate ingredients unmixed, $19.64.

Analyses and valuations of fertilizers, J. P. STREET, W. P. ALLEN, and V. J. CARBERRY (*New Jersey Stas. Rpt. 1903, pp. 19–75*).—This is a reprint of Bulletin 168 of the station (E. S. R., 15, p. 571) with the addition of a list of manufacturers whose goods were sampled and analyzed during 1903, data relating to the wholesale prices of fertilizing materials in New York during different months of the year 1902 and valuations for 1903, and analyses of 6 samples of fertilizers received too late to be included in Bulletin 168.

Fertilizer analyses, F. W. ROBISON (*Michigan Sta. Bul. 217, pp. 23*).—Analyses of fertilizers examined under State laws during 1904 are reported, with notes on the objects of the inspection and on the nature and use of fertilizers and manures.

Analyses of commercial fertilizers and manurial substances, C. A. GOESSMANN (*Massachusetts Sta. Bul. 100, pp. 30*).—Analyses of samples of commercial fertilizers secured in the course of the regular inspection and of miscellaneous materials sent to the station for examination, including wood ashes, lime ashes, nitrate of soda, cotton-seed meal, dried blood, high-grade sulphate of potash, carbonate of potash, sulphate of potash-magnesia, dissolved boneblack, burned bone, phosphatic slag, tankage, ground bone, dry ground fish, wool waste, mill waste, factory waste, sheep manure, liquid manure, compound fertilizers, and soils. A schedule of trade values for 1903 and 1904 is given.

FIELD CROPS.

Field experiments at Lauchstädt, W. SCHNEIDEWIND ET AL. (*Landw. Jahrb., 33 (1904), No. 2, pp. 165–250, 273–334, pls. 6*).—The fifth report of the station presenting the results obtained in 1902 and 1903. The results of previous years have been noted (E. S. R., 14, p. 852).

The average results of 6 years' experiments show that 100 kg. of barnyard manure was worth 1 mark (about $2.50 a ton), its residual effect being included in the valuation. The highest yields of beets and potatoes were obtained where the manure was applied with commercial fertilizers. The increase in the yields of roots and tubers due to the manure was greatest when the same was applied without the addition of nitrate of soda, but the highest absolute yields were obtained where the two substances were given together.

With reference to leaf production, the reverse sometimes takes place. During the seasons favoring the growth of leaves more of the nitrogen in the manure was used by the plants when applied with nitrate of soda than when applied alone. This is attributed to the fact that the nitrate in conjunction with the manure forces the plants and consequently lengthens the vegetative period, which results in a greater nitrogen consumption than where the manure is applied alone. This greater quantity of nitrogen is used in increasing the amount of foliage and does not affect the yield of the roots and tubers. For this reason moderate applications of manure with the nitrate of soda in proportion are considered most profitable. The use of about 30,000 kg. of manure per hectare is recommended for beets, and from 20,000 to 30,000 kg. for potatoes. Fresh manure was not used in these experiments, and the results given, therefore, were not influenced by the action of denitrifying bacteria.

Experiments in the preservation of barnyard manure by means of chemicals gave negative results, and the authors recommend keeping manure moist and well packed under cover, or using peat and soil to prevent deterioration.

Green manuring with peas, beans, and vetches after summer or winter barley gave good results with beets, but was less effective with potatoes. This result is considered due to the shorter period of growth of the potato and its lower nitrogen requirements, and also to the cultural conditions of the crop, which favor the accumulation of available nitrogen in the soil during the vegetative period to a greater extent than is the case with beets and cereals.

A number of plats received no nitrogen, and although the experiments have been in progress for several years the yields have not diminished, and the same quantities of nitrogen have been taken up by the plants during the different years. Beets, potatoes, and wheat have given comparatively high yields, while barley after the beets, which draw heavily upon soil fertility, gave the lowest yield.

For the Lauchstädt soil the following quantities of nitrogen per hectare are recommended: For sugar beets (1) 60 to 75 kg. in two applications, either both in the form of nitrate of soda or the first one as ammoniacal superphosphate, and if barnyard manure was applied the year before the application should be a little less; (2) 40,000 kg. of barnyard manure and 200 kg. of nitrate of soda, or preferably 30,000 kg. of barnyard manure and from 200 to 300 kg. of nitrate of soda; (3) green manuring and from 200 to 300 kg. of nitrate of soda. For potatoes (1) 45 kg. in the form of nitrate of soda and ammoniacal superphosphate; (2) 30,000 kg. of barnyard manure and, if the same is of poor quality, from 100 to 200 kg. of nitrate of soda in addition. For winter wheat (1) 20 kg. of ammoniacal nitrogen given in the fall; (2) the second spring after applying barnyard manure, a top-dressing of 100 to 150 kg. of nitrate of soda, and the third spring a top-dressing of 200 kg. of nitrate of soda.

For barley, the first year following a heavy application of manure no nitrogen should be given; the second year 20 kg., and the third year from 20 to 30 kg. of ammoniacal nitrogen should be applied. For oats, the second year after manuring 30 kg., and the third year 45 kg., partly in the form of ammoniacal nitrogen. A top-dressing of sulphate of ammonia, especially on highly calcareous soils, was not found beneficial, and the results indicated that, in order to prevent the loss of nitrogen through the volatilization of ammonia, this substance should be mixed with ammoniacal superphosphate and worked into the soil immediately upon application.

Phosphoric acid increased the yields but little and proved unprofitable when used with barnyard manure. Heavy applications on plats receiving no barnyard manure were also unprofitable, and it is concluded that, for beets and potatoes grown without barnyard manure, from 50 to 60 kg., and for cereals, under the same conditions, from 40 to 50 kg. of phosphoric acid per hectare is sufficient for the particular soil.

Potash was effective wherever the crops were grown without the use of barnyard manure. Annual applications, however, are not recommended on account of the injurious effect upon the mechanical condition of the soil which is likely to result. Of the different crops the potato showed the greatest potash requirements. The following quantities of potash per hectare are recommended: Potatoes, 300 kg. of 40 per cent potash salt; beets, 300 kg. of 40 per cent potash salt, or from 800 to 1,000 kg. of kainit; cereals, from 400 to 500 kg. of kainit. The potash in sugar-house refuse was much less effective than that in 40 per cent potash salt.

The roots of fodder beets removed the greatest quantity of potash from the soil as compared with potatoes and sugar beets, the potatoes removing much more than the beets. The leaves of the sugar beets contained more potash than the leaves of the other root crops. On soil receiving only commercial fertilizers with no potash, sugar beets removed 225 kg. of potash per hectare, and potatoes only 44 kg. This result shows that the sugar beet is better adapted than the potato to the use of the potash in the soil, and it also explains why the potato has

such a high potash fertilizer requirement. The largest quantities of sodium were taken up by the fodder beets, the contents of the roots being especially high. The roots of sugar beets contained but little sodium, practically the entire quantity taken up by the plant being found in the leaves. The potatoes contained a very small quantity of this element, whether the soil was fertilized with barnyard manure, potash salts, or with nitrate of soda. Chlorin was most extensively used by the fodder beets, and also in comparatively large quantities by the potatoes. The roots of the sugar beets were very low in chlorin, nearly all of it taken up being found in the leaves. The fodder beets responded most readily to the use of crude potash salts, which contain a large quantity of sodium.

The square-head varieties of wheat gave the highest yields wherever they survived the winter. In general, these varieties are not very resistant to the cold season, and improvement by breeding to overcome this defect is recommended. The following varieties of cereals gave good results: *Winter rye*—Petkus and Heine Zeeländer. *Winter barley*—Bestehorn Giant and Groningen. *Summer barley*—Svalöf Chevalier, Heine Chevalier, Hanna, and Goldthorpe. *Oats*—Strube, Ligowo, Leutewitzer Yellow, and Beseler No. III. *Potatoes*—Cimbal Primel, Cimbal Yellow-Fleshed Table potato, Ella, Cimbal Early Prolific, Rosalind, and Up-to-Date.

The total dry matter produced per hectare in the roots of fodder and sugar beets was about the same, but when taking the leaves into consideration the larger quantity was produced by the sugar beets. Fodder beets planted 9x14$\frac{1}{2}$ in. produced more dry matter than those planted 12x18 in.

Field experiments in Staffordshire and Shropshire and at the Harper-Adams Agricultural College, Newport Salop (*Joint Rpt. 1903, pp. 25*).—At the college the results of manuring meadow land in 1903 showed that a complete dressing of commercial fertilizers gave the best results, although incomplete applications also increased the crop. Potash fertilizers did not cause a marked increase in yield of the herbage, but they materially improved its quality. The largest net profits, amounting to £1 17s. 2d. per acre, was obtained from an application of 1.7 cwt. of nitrate of soda, 2$\frac{1}{2}$ cwt. of superphosphate, and $\frac{1}{2}$ cwt. of sulphate of potash.

A test was made of 12 varieties of oats, including the white, yellow, and black types. New Abundance, a white oat, is considered the best variety, its yield in both grain and straw being very good. Heine German Prolific gave the largest yield, but its grain was not equal to that of New Abundance in quality. Among the black oats Excelsior gave promising results, but its straw was very stiff and coarse.

Fourteen varieties of mangels, including the Yellow Globe, Golden Globe, Golden Tankard, and Sugar Mangel types were grown for comparison. Carter Windsor, a Yellow Globe variety, led with a yield of 44 tons 4 cwt. per acre. The average yields for the Yellow Globe, Golden Globe, Golden Tankard, and Sugar Mangel varieties were 39.5, 28.75, 28.5, and 27.5 tons per acre, respectively. Each type produced 3.5 tons of dry matter per acre, with the exception of the Golden Globe varieties, which produced only 3 tons.

In a fertilizer experiment the largest increase in the yield of mangels, 10 tons 17 cwt., was obtained from an application consisting of 15 tons of barnyard manure, 3$\frac{1}{2}$ cwt. of dissolved bone, 1 cwt. each of sulphate of ammonia and nitrate of soda, and 4 cwt. of salt per acre. The addition of 4 cwt. of salt proved beneficial. Potash was not very effective. Fifteen tons of barnyard manure per acre seemed an average dressing for this crop. Home-mixing of the fertilizers was found profitable.

Among different fungicides, Bordeaux mixture proved to be the most effective in the prevention of finger-and-toe disease in swedes and turnips. Lime did not seem very effective.

In fertilizer experiments with swedes in Shropshire barnyard manure gave an increase over commercial fertilizers, and the need of this crop for phosphates was clearly shown. In this test also, home-mixing of the commercial fertilizers proved profitable as compared with the purchase of ready-mixed fertilizers.

In Staffordshire the results of experiments on manuring meadows show that a complete commercial fertilizer was most effective, being followed by barnyard manure at the rate of 12 tons per acre annually. The use of lime was not profitable. Barnyard manure gave a large increase in yield in every case, while nitrate of soda, basic slag, and kainit, applied singly, were not always effective.

In a variety test with potatoes, Scottish Triumph and Up-to-Date gave the best yields. Up-to-Date, however, is regarded as a variety showing signs of deterioration. Fertilizer experiments with potatoes indicated that an application of 20 tons of barnyard manure per acre is not so beneficial as an application of 10 tons with a complete mixture of commercial fertilizers. In experiments with mangels a large increase of crop was obtained by the substitution of 4 cwt. of kainit for the same quantity of salt, and it was also shown that a medium quantity of barnyard manure given with a complete commercial fertilizer is most profitable.

Field experiments [in Ireland], 1903 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1904), No. 3, pp. 469–510*).—As in the 2 previous years, Archer Chevalier barley again produced larger yields than either Goldthorpe or Standwell. In quality it was inferior to the other varieties and the percentage of small grains was also higher. It was found that Archer Chevalier did not ripen as well under unfavorable weather conditions as the other varieties, but the loss of heads at ripening was considerably less. Archer Chevalier needs a dry soil, while Goldthorpe and Standwell do best on rich and stiff soils. The results of cooperative fertilizer experiments with barley vary considerably, and it is recommended that farmers consider principally the results obtained on their own lands. Commercial fertilizers proved profitable on soils in low condition, but on lands in good condition they did not give profitable results.

In a second variety test with barley on a smaller scale than the first, Archer Chevalier has in the 2 previous years produced a larger average yield than either Garton Brewers Favorite, Garton Invincible, Hallett, Pedigree, or Scotch Chevalier. The Garton varieties were low in yield, but in quality they were superior to the Chevalier varieties, and also seemed to mature better in unfavorable ripening weather. The results of the fertilizer tests show that 1 cwt. of sulphate of ammonia alone per acre retarded maturity, but when given with 3 cwt. of superphosphate the application produced a profitable average increase. The use of 3 cwt. of kainit per acre was not satisfactory, but where the kainit was applied with superphosphate only the quality of the grain was improved to such an extent that, although the yield was not the best, the profit was the largest.

The results of cooperative fertilizer experiments on meadows for the season, as well as those for the 2 previous years, indicate that in the different soils under test 1 cwt. of nitrate of soda, 2 cwt. of superphosphate, and 2 cwt. of kainit per acre can be profitably applied.

The report of the fertilizer experiments with potatoes shows that 20 tons of barnyard manure per acre apparently increased the yield by 5 tons and 1 cwt., and an application of 15 tons by 4 tons and 8 cwt. in one instance, and by 4 tons and 5 cwt. in another. Commercial fertilizers applied in addition to the lighter dressing of barnyard manure gave in all cases a larger yield than the heavier dressing of manure alone and also proved more profitable. Of the varieties of potatoes grown by all the experimenters Up-to-Date and Beauty of Bute produced the best crops.

Mangels were given 15 tons of barnyard manure per acre as a general application for a series of plats, and in some instances commercial fertilizers were added. The use of the manure alone gave a good profit and the addition of a complete mixture of commercial fertilizers increased the net profit by 37s. 6d. The substitution of 4 cwt. of salt for 2 cwt. of kainit in the application proved beneficial.

Experiments conducted with oats have shown that kainit applied alone is not satisfactory. The use of superphosphate and sulphate of ammonia each alone resulted in much smaller profits than the use of the 3 substances in combination. In a com-

parative variety test, Goldfinder, Canadian Banner, and Waverley led in productiveness with a yield of 22 cwt. and 2 quarters per acre each. These same varieties ranked first the year before.

In experiments with turnips a complete fertilizer gave better results than an incomplete application. In a second experiment 10 tons of barnyard manure and 4 cwt. of superphosphate per acre gave a slightly better yield than 20 tons of barnyard manure alone. The yields of varieties of swedes and of yellow turnips are given in a table.

Reports of Danish state plant experiment stations, 1903, F. HANSEN, K. HANSEN, N. P. NIELSEN, A. J. HANSEN, and L. HELWEG (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 303–323*).—An account of crop conditions at these stations during the season of 1903, with brief statements of the main results of plant culture experiments conducted during the year.—F. W. WOLL.

On the growing periods of crops in northern Norway, L. P. NILSSEN (*Tidsskr. Norske Landbr., 11 (1904), No. 6, pp. 235–272*).—Statistics and other evidence concerning crop production in northern and southern Norway were collected to test the hypothesis of Schübeler that, on account of the long summer days in northern latitudes, plants require a shorter growing period in these regions than they do farther south. Data regarding the time of sowing and harvesting of barley, oats, rye, peas, potatoes, and turnips; the time of first growth, blossoming, and cutting of meadow and timothy grass; blossoming and ripening of wild berries, and the fall of leaves are presented.

It is shown that the shortest growing periods are found in the inland counties, and that in general the time required to produce grass ready for cutting, or to ripen grain or potatoes, increases with the latitude until Finmarken is reached, where the requisite weather conditions for grain growing are not found. The average growing periods of various crops for a number of years in different sections of Norway, going from the south northward, are shown in the following table:

Average growing periods of crops in Norway.

Section of country.	Six-rowed barley.	Oats.	Spring rye.	Peas.	Potatoes.	Meadows, turning green to cutting.	Timothy, blossoming to seed formation.
	Days.	*Days.*	*Days.*	*Days.*	*Days.*	*Days.*	*Days.*
First	86.8	109.3	118.5	120.0	132.7	52	33.5
Second	92.9	112.3	114.4	116.7	130.1	56	40.2
Third	96.3	117.3	117.6	....	132.3	66	38.2
Fourth	100.9	127.3	115.5	132.5	133.8	65	40.0
Fifth	106.3	116.2	146.0	124.6	129.2	58	47.7
Sixth	103.7	120.3	....	....	104.8	69	61.0

The first section of the country includes the counties of Smaalenene, Jarlsberg, and Laurvig; the second, Akershus, Hedemarken, Kristian, Buskerud, and Bratsberg; the third, Nedenäs, Lister, and Mandal; the fourth, Stavanger, North and South Bergenhus, and Romsdal; the fifth, North and South Drontheim, and the sixth, Nordland, Tromsö, and Finmarken.

In view of these results the hypothesis of Schübeler is considered applicable only in those northern localities which have specially favorable soil and weather conditions. The causes operating against a short growing period in the north are prevailing cloudy weather during May and June, and low air and soil temperatures during the summer months. These disadvantages, as a rule, more than outweigh the influence of the prolonged sunlight of the summer days, and tend to reduce the luxuriance of the vegetation and to shorten the growing period of plants.—F. W. WOLL.

Hawkesbury Agricultural College and Experimental Farm, G. L. SUTTON (*Agr. Gaz. New South Wales, 15 (1904), No. 3, pp. 283–290*).—Varieties of wheat from

France, South Australia, South Africa, and Western Australia were grown to determine their rust-resistance rather than their productiveness, and the results are arranged in tabular form in the order representing their resistance to the disease. The variety Nutcut, the seed of which was obtained from Wagga, heads the list and is reported as being a fine wheat for hay and grain.

Notes are also given on the culture at the farm of alfalfa, cowpeas, swedes, rape, maize, and sorghum.

On the uncertainty of the hay crop at the agricultural college of Norway, G. HOLTSMARK (*Norsk Landmandsblad, 23 (1904), No. 27, pp. 319–321*).—Observations on the variations in the yields of hay during the 25 years 1878–1902 show that the average yield of hay on first year's meadow during this period has been 417 kg. per dekare, 487 kg. on second year's, and 424 kg. on third year's meadow. By applying the theory of probabilities, the probable variations from the average yields were found to be 121 kg., or 29 per cent, on first year's meadow; on second year's, 111 kg. (22.8 per cent), and on third year's, 102 kg. (24 per cent). Another method of computation gave a probable variation of 92 kg., or 20.5 per cent of an average yield.—F. W. WOLL.

Plan of culture trials at Danish plant experiment stations, 1904–5 (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 199–275*).—A detailed statement of the various experiments in progress or planned for the year 1904–5, at the Danish plant experiment stations at Lyngby, Tystofte, Abed, Askov, and Vester Hassing, as well as of cooperative experiments with root crops at various farms conducted under the direction of these stations.—F. W. WOLL.

Yields obtained on light sandy soil without the use of barnyard manure (*Deut. Landw. Presse, 31 (1904), No. 54, p. 483*).—The yields of potatoes and winter rye for 10 years are recorded. The rotation consisted of yellow lupines for green manuring grown without a nurse crop and with the use of commercial fertilizers, potatoes without commercial fertilizers but receiving the benefit of the green manure, and winter rye with applications of commercial fertilizers. The plats were 1 morgen in size and received for lupines annually 600 lbs. of kainit. For the first crop of lupines each plat received 300 lbs. of Thomas slag, and 150, 200, and 150 lbs. for the second, third, and fourth crops, respectively. The potato plats received 100 lbs. of Thomas slag and 250 lbs. of kainit each year. Half of the experimental field received 1,100 lbs. and 1,250 lbs. of marl per morgen in 1895 and 1899, respectively.

The rye produced an average yield of 11.25 cwt. of grain and about 26 cwt. of straw per morgen. The use of marl increased the yield of rye by 61 lbs. per morgen, and the yield of potatoes by 13.5 cwt., and also seemed to have reduced the scab in the potato crop. The average yield of potatoes for the 10 years was 84.9 cwt. per morgen.

Staple crops, E. B. FERRIS (*Mississippi Sta. Bul. 83, pp. 16–34*).—The experiments here described are similar to those previously reported (E. S. R., 15, p. 142). Fertilizer experiments conducted with corn, cotton, sweet potatoes, and Spanish peanuts, showed that phosphatic and nitrogenous fertilizers increase the yields of these crops on the station soil. Phosphoric acid was more effective than any other element. The use per acre of from 125 to 200 lbs. of a mixture consisting of 750 lbs. of cotton-seed meal and 1,250 lbs. of acid phosphate is recommended for corn and cotton.

In the different variety tests the following were the most productive sorts: *Corn*—White Majestic and Major Berry; *cotton*—Duncan Mammoth Big Boll Prolific and Shine Extra Early Prolific; *cowpeas*—Unknown, Whip-poor-will, Southdown, and New Era. Among different forage crops teosinte ranked first in yield. Cowpeas planted at the rate of 60 lbs. of seed per acre yielded 2,520 lbs. of hay per acre, while half that quantity of seed gave 2,440 lbs.

Study of the variation in mineral matter during the ripening of seeds (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 26, pp. 1712–1714*).—The results are

reported of determinations of the mineral matter in white lupines on July 4, 11, 17, 27, 30, and August 10, 22; and of Spanish beans August 19, 27, September 4, 11, 21, and October 2, 16.

There was an increase in the total ash in both hulls and seeds of lupines up to August 10. In the beans there was an increase in the case of the hulls up to September 21; in case of seeds until October 16. The lime and magnesia increased steadily during the earlier stages of growth, but declined toward the end of maturity in case of the hulls of both lupines and beans. In case of the seeds, however, there was a continuous increase up to the end of ripening. Potash increased throughout in total amount, but the percentage remained constant in the hulls and declined in the seeds. Phosphoric acid increased up to a certain point and then decreased in the hulls, although it did not appear to migrate to the seed to any considerable extent.

Composition of tubers of different varieties of Jerusalem artichoke harvested in spring and fall, P. BEHREND (*Jour. Landw., 52 (1904), No. 1–2, pp. 127–143*).—Historical notes on the study of the chemical composition of Jerusalem artichoke tubers are given and the author's work is described. Analyses of 7 samples each of fall harvested and spring harvested tubers are reported. In each case the composition of the fresh sample and of the dry matter is given.

Analyses of 3 samples, made from 3 to 4 months after storing, are also reported. A summary of the analyses is given in the following table:

Composition of Jerusalem artichoke tubers of spring and fall harvesting.

	Water.	Dry matter.	In dry matter. Water soluble matter.	Crude protein.	Crude fat.	Nitrogen-free extract.	Crude fiber.	Ash.	Pentosans.	Total carbohydrates.	Total nitrogen.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Spring:											
Maximum..	83.93	24.12	89.90	10.73	1.30	88.33	5.17	7.49	6.47	76.14	1.72
Minimum..	75.88	16.07	80.88	3.31	.64	75.75	3.17	3.45	4.23	61.75	.58
Average....	79.03	20.97	84.67	6.20	.85	84.37	3.96	4.82	5.51	70.61	1.00
Fall:											
Maximum..	81.80	25.00	86.98	9.29	.86	84.93	4.00	6.37	4.84	70.80	1.49
Minimum..	75.00	18.20	82.92	5.71	.48	80.74	2.99	4.22	3.88	63.10	.91
Average....	79.70	20.30	85.63	7.46	.70	83.26	3.35	5.38	4.38	68.46	1.15

Variety tests with barley, W. EDLER (*Fühling's Landw. Ztg., 53 (1904), Nos. 9, pp. 328–331; 10, pp. 372–376; abs. in Deut. Landw. Presse, 31 (1904), No. 22, pp. 254, 255*).—Twelve cooperative tests were made with Goldthorpe, Chevalier, and Hanna barley. The average yields of grain per hectare were 3,316 kg., 3,252 kg., and 2,843 kg., and the average yields of straw, 4,111 kg., 4,090 kg., and 3,862 kg., respectively. The average weight per liter was 692 gm., 688 gm., and 685 gm. for Chevalier, Hanna, and Goldthorpe, respectively. Goldthorpe stood first in the weight per thousand grains, and was followed by Chevalier and Hanna in the order given. The weight per thousand grains in the series of tests varied from 43.26 gm. to 50.48 gm. In mealiness Goldthorpe ranked first and Hanna last.

The results also show that the locality had a marked influence on the mealiness of the grain. Goldthorpe contained 10.10 per cent of protein in the dry matter, Chevalier 10.62 per cent, and Hanna 10.73 per cent. Attention is called to the following classification of brewing barley as based on the protein content: Under 9 per cent of protein in the dry matter first grade, 9 to 10.5 per cent second grade, 10.5 to 11.5 per cent good, and over 11.5 per cent medium and poor.

Final report of experiments with malting barley and wheat, 1893-1902, C. SONNE (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 56–134*).—This report finishes the extensive work done by a committee of the Royal Agricultural Society of Denmark, under the direction of the author, in determining the most desirable varieties

of wheat and malting barley for Danish farmers. The trials of the committee cover a period of 20 years, and a report for the first 10 years has been previously published (E. S. R., 5, p. 716; 9, p. 941).—F. W. WOLL.

Roo crops adapted to culture on moor soils, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 18 (1904), No. 4, pp. 294–302*).—Experiments made at Flahult Experiment Station during 1897–1902 show that turnips gave the most certain and the largest crops, while carrots, Swedish turnips, and especially fodder beets produced very small yields. Bortfelder and Early Improved turnips, and Champion, White Belgian, Giant, Orange Yellow, and James carrots were the most valuable varieties grown.—F. W. WOLL.

Experiments with buckwheat, S. TRETYAKOV (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, pp. 1–17*).—Since 1895 Common Siberian and Silver Hull buckwheat have been grown in comparison on the Poltava Experiment Field. In 1901 and 1903 the common buckwheat was grown on tilled and fallowed forest land of a clay soil, and also on cultivated and fallowed chernozem. In 1902 seeds of different weight of this same variety were tested. The seeds weighed 1.362, 1.998, and 2.198 gm. per 100, corresponding to a mesh of 1, 2, and 4 mm., respectively.

The average results for the years 1895 to 1902, inclusive, show that Siberian buckwheat yielded 870.6 lbs. of grain and 2,079.6 lbs. of straw, and Silver Hull buckwheat 735.5 lbs. of grain and 2,510 lbs. of straw per acre, the ratio of straw to grain being 2.7 and 4.1, respectively. The author concludes that buckwheat comes up quicker on chernozem soil, but that the period of growth is longer than on forest clay. Owing to the higher moisture content and the greater fertility of chernozem as compared with the other soil, the yields of grain and straw are heavier. On the fallow of both soils the development of the crop was weaker and the yield was slightly less than on the soil continuously under cultivation. Small and light but plump kernels of buckwheat are richer in nitrogen and ash than plump, heavy, large kernels. The results of a 1-year's test indicated that the largest yields are obtained from plump small seed and the lowest from seed of medium size and weight. Siberian buckwheat succeeds better at Poltava on account of its shorter growing period.—P. FIREMAN.

A study of correlative characters in Székler maize, C. FRUWIRTH (*Fühling's Landw. Ztg., 53 (1904), Nos. 6, pp. 200–208; 7, pp. 255–258*).—The weight of the whole plant, ear, stalk and leaves, husks and cob, and the percentage of grain and stalk based on the total weight of the plant, and of husks and cob based on the weight of the ear, were determined and are recorded in tables.

The single-eared plants produced from seed of 6 selected stalks were grouped according to their maturity. Late ripening appeared correlative with a high weight of the entire plant as well as with a high weight of grain, husks, cob, and ear. The percentage of the cob to the ear by weight was in all cases greater in the late maturing plants than in the early ones, but the percentage of grain was lower. A high total weight of the plant is not regarded as a very definite factor in grain production.

In selecting for improvement a high yield, coupled with a high per cent of grain, is considered of first importance. A long ear usually indicated a high weight and high percentage of grain and a high weight of kernel, but the percentage of cob and husks was also high, and these qualities are regarded as unfavorable. A heavy development of the husks retards ripening in the regions where the variety is grown. A large number of internodes was apparently connected with a high weight of grain per plant, a low weight of kernel, a low percentage of grain, and a high percentage of cob, and was indicative of a high production of stover. A thick stalk, being associated with a low percentage of grain and a high percentage of cob, did not seem to be a favorable factor.

Manuring of cotton, G. P. FOADEN (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 1, pp. 1–6*).—This article discusses the manuring of cotton, and incident-

ally embodies the results of some experiments along that line. For general purposes an application of 60 kilos of nitrate of soda, 40 kilos of sulphate of ammonia, and 400 rottolis of superphosphate per feddan are recommended. This application gave profitable results in the several experiments reported. The application was also found profitable when applied together with 10 cubic meters of barnyard manure. The results further showed that the bulk of the nitrogen applied should be in the form of nitrate of soda. Practically no increase was obtained by the use of potash manures.

Flax and linseed industry, J. KNIGHT (*Guides to Growers [Dept. Agr., Victoria], No. 50, pp. 16, figs. 9*).—This is a popular bulletin on the culture of flax, with special reference to conditions obtaining in Victoria.

Gram (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 9, pp. 202, 203*).—Data regarding the composition of gram or chick-pea are quoted.

Job's tears seeds, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 9, p. 202*).—Analyses by H. S. Hammond are reported.

Jute culture, L. HAUTEFEUILLE (*Agr. Prat. Pays Chauds, 3 (1904), No. 18, pp. 647–657, figs. 2*).—Culture and fertilizer experiments are reported from Bat-Bat, Indo-China. Jute was grown on soil worked 25, 40, and 60 cm. deep, but the depth of cultivation had no effect upon the development of the plants.

Mineral superphosphates, applied at the rate of 1,600 kg. per hectare, remained without effect because the phosphoric acid did not become available in time for the crop. Ashes had a marked influence, especially on the early growth of the plants, and are believed to have acted not only as a source of plant food, but also in the line of improving the soil. Other results obtained indicated that jute can profitably be cultivated by the native system, in which night soil is used as a fertilizer.

Variation in oat hybrids, J. H. WILSON (*Nature, 69 (1904), No. 1792, p. 413*).—The results of crossing white varieties of oats, and also black varieties with white ones, are reported. The author concludes from the study of available samples that the form of the ear will no doubt be found to be a constant Mendelian character. The material examined further showed the dissociation of the color of the grain. A summary of the results is shown in the following table:

Results with different oat hybrids.

Hybrids.	Number of grains sown.	Number of plants harvested.	Number with black grains.	Number with white grains.	Ratio of black to white grains.
Goldfinder × Black Tartarian	1,000	567	433	134	3.23:1
Goldfinder × Black Tartarian	900	566	415	151	2.75:1
Black Tartarian × White Canadian	800	532	379	153	2.48:1
Black Tartarian × Abundance	600	274	209	65	3.21:1

The Black Tartarian oat with reference to color of the grain was dominant, whether serving as pollen or seed parent. The proportion of black to white forms in the second generation closely approximated 3:1.

Drying tobacco leaves either primed or on the stalk, E. C. J. MOHR (*Landw. Vers. Stat., 59 (1903), No. 3–4, pp. 252–292; abs. in Centbl. Agr. Chem., 33 (1904), No. 7, pp. 459–461*).—Experiments are reported from which the conclusion is reached that, contrary to opinions held by earlier investigators, if tobacco leaves are allowed to dry on the stalk many substances of the greatest importance to the production of the seed and the development of the buds and shoots are transported in considerable quantities from the leaves to the stem.

Of the ash constituents, lime and magnesia are largely stationary. Sulphuric acid moves in greater quantities and is exceeded in translocation by chlorin and potash, while phosphoric acid is the most readily transported substance. Attention is called

to the movements and changes of the carbohydrates and the absence of these substances in properly dried leaves. With reference to the nitrogen compounds, the author states that the albuminoids and nicotin have a low movability, while ammonia and nitric acid, and especially the amids and amins, show a high power of translocation. The greater portion of the substances translocated within the plant were alkaline. The effect of the removal of the leaves on the production of seed is discussed.

Vetch sown with oats on fallow, F. GUBINE (*Zeml. Ghaz., 1903, No. 30, pp. 123, 124; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, pp. 115, 116*).—The results of growing vetch with oats for a series of years at the Moscow Agricultural Institute show that this crop draws heavily upon the soil moisture, and that it is detrimental to an immediately following crop of winter rye. The yield of winter rye under these conditions is reduced from 30 to 35 per cent as compared with the yield on black fallow.—P. FIREMAN.

Observations on winter wheat in the Kherson Government, P. N. KOZLOVSKI (*Vyestnik Selsk. Khoz., 1903, Nos. 14, 15, 18, 23, 26; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 1, p. 114*).—The development of winter wheat on different kinds of fallow is described in detail. At the time of sowing black fallow contained 18.4 per cent of soil moisture at a depth of 10 cm., while American corn fallow contained only 9.21 per cent. The crop on black fallow came up 26 days earlier and was much better developed at the beginning of winter than the crop on corn fallow. Although rains were plentiful the following spring the wheat on the black fallow retained this decided advantage.—P. FIREMAN.

Macaroni wheat in foreign markets (*U. S. Dept. Com. and Labor, Spec. Consular Rpts., 29 (1904), pp. 76*).—A series of reports by the consular officers of the United States in Europe, Northern Africa, and Argentina on the production and consumption of macaroni wheat in their districts.

HORTICULTURE.

Report of the horticulturist, A. T. JORDAN (*New Jersey Stas. Rpt. 1903, pp. 289–345*).—The records of another year showing the yields with asparagus and a number of small and orchard fruits, when differently fertilized and cultivated, are reported. This work has been under way for a number of years (E. S. R., 15, p. 149), and summaries are given of the results thus far obtained with asparagus and raspberries for the whole period. These summaries have been published in bulletin form and noted previously (E. S. R., 16, p. 262). The usual meteorological data are incorporated in the report.

In the fertilizer work with asparagus and small fruits a comparison is being made of the relative value of barnyard manure, a complete commercial fertilizer, the same fertilizer plus bone and potash, and the same fertilizer plus bone, potash, and nitrate of soda. Duplicate plats in each case are irrigated.

Irrigation has increased the total yield of raspberries on the average about 2 per cent. With blackberries irrigation has increased the average yield 4½ per cent. Early Harvest, Eldorado, and Erie have given the largest yields in the order named. With irrigation the heaviest yield has been obtained on the manured plat. Without irrigation the heaviest yield was obtained on the plat receiving complete fertilizer plus bone and potash. With currants the average yield from the irrigated plats exceeds that from the unirrigated by 9½ per cent. The largest yields both with and without irrigation have been obtained on the manured plats.

A record is given of the yields of a number of individual currant bushes, which shows the production of individual bushes of the same variety to vary between 1,405.2 to 6,149.4 qts. per acre. With gooseberries the average yields for 6 years are slightly in favor of irrigation. Similarly manured plats have averaged larger in yield than the plats fertilized with complete commercial fertilizer.

The records of yields are given for a number of varieties of strawberries and for a number of orchard fruits set in permanent plats. No striking results have been brought out in these trials as yet.

Experiments in crossing plants, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1903, pp. 463–490, pls. 6, dgm. 1*).—Data in continuation of that previously noted (E. S. R., 15, p. 152) are given showing the results obtained in growing the progeny of crosses of different varieties of sweet corn, salsify, eggplants, cucumbers, squashes, tomatoes, Wax beans, and Lima beans. The account of the development of the Voorhees Red variety of sweet corn, which the authors originated by crossing Black Mexican with Egyptian, has been noted from another source (E. S. R., 15, p. 1075). A plate is given showing the character of the cross obtained between Black Mexican and Country Gentleman varieties of sweet corn. Country Gentleman appears to be easily fertilized by the Black Mexican, while Black Mexican is only rarely crossed with Country Gentleman.

Seed of the third-generation stock of eggplant began fruiting as early as plants of the parent types—New York Improved and Early Long Purple; and, while some of the fruits resembled those of the parents, the majority were more or less bell-shaped. Illustrations are given of some Japanese eggplants. Crosses of New York Improved eggplants upon Black Snake gave fruits 10 to 12 in. long and 3 to 4 in. in diameter. The quality is noted as excellent, and the shape desirable from a culinary standpoint. Other eggplant crosses were made as follows: Long White upon New York Improved, Round White upon Black Pekin, Fordhook Improved upon Mammoth Pearl. Special attention is called to the remarkable vigor of crosses of Long Purple and New York Improved.

Illustrations are given of variations in cucumbers obtained by crossing White Spine and White Pearl, and also Telegraph upon Znaim.

A number of varieties of tomatoes were tested, the heaviest yielding of which was Magus. Of 3 varieties of dwarf Lima beans tested Burpee gave more than double the yield of either of the other two. Henderson was the earliest maturing of the 3 varieties and had a longer fruiting period. In another test Henderson and Willow Leaf proved more productive than Burpee, Thorburn, or Dreer.

Proceedings International Conference on Plant Breeding and Hybridization (*Hort. Soc. New York Mem., 1 (1902), pp. 271, figs. 15*).—This is a report of the papers and discussions before the International Conference on Plant Breeding and Hybridization, held under the auspices of the Horticultural Society of New York, September 30 and November 1–2, 1902. An account of this conference has already been presented (E. S. R., 14, p. 208).

Proceedings of the fruit culture conference held in connection with the Irish-grown fruit show at the Cork International Exhibition (*Dept. Agr. and Tech. Instr. Ireland, 1902, pp. 23*).—The proceedings are made up of a number of papers, by as many different authors, on various phases of fruit culture in Ireland, the trend of the papers being the encouragement of the development of fruit growing in Ireland.

Fruits and vegetables, E. B. FERRIS (*Mississippi Sta. Bul. 83, pp. 7–15*).—Brief notes, with tabular data in some instances, are given on results of variety tests with a number of garden beans, tomatoes, watermelons, strawberries, and miscellaneous fruits and vegetables.

Cantaloupe culture, W. F. ALLEN (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 82–86*).—The author grows cantaloupes on an extensive commercial scale in Maryland. After the land has been thoroughly prepared, he plows out furrows about 8 in. deep and $4\frac{1}{2}$ to 5 ft. apart, going twice in the same row in order to broaden out the trench. The trench is then about half filled with compost or stable manure, and thoroughly mixed with the soil by cultivating up and down the row 4 times or more. In order to prevent loss from frost or insects and to insure a stand, at least 3 sepa-

rate plantings are made beside each other about a week apart. If the first planting is killed by frost, the second one may come up; whereas, if the second planting were delayed until after the frost appeared, there would be a loss in earliness of 10 days or more.

In harvesting the melons the first half of the season they are picked as soon as the stem can be forced with the thumb to part from the fruit without breaking off a piece of the melon with it. This condition should occur before the cantaloupe begins to turn yellow. A cantaloupe in this condition is considered just right to ship, but the day following would be quite yellow and unfit for transportation. "After the season is one-half or two-thirds gone and the weather is very hot, as is usually the case, I find it safe to cut them off with stems after they are full grown and have become densely netted." As no cantaloupes are picked on Sunday, many melons are overripe on Monday, and these are the ones that are saved for seed. It is important that the melons be stored in the refrigerator car as soon after picking as possible.

Blanching of wild chicory, V. ENFER (*Rev. Hort. [Paris], 76 (1904), No. 20, pp. 501–503*).—Blanched chicory is also known under the name of *Barbe de capucin*. Directions are given for harvesting the wild roots and preparing them for forcing for the production of blanched stems and leaves.

The chocho, A. F. T. SOMERVILLE (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 835, 836, fig. 1*).—The chocho appears to be another name for the chayote (*Sechium edule*). This vegetable appears to grow remarkably well in the colony, account being given of a 2-year-old vine which yielded 300 fruits. Two fruits are reported as sufficient for a meal for four persons. Directions are given for cooking this vegetable.

Concerning the chemistry of fruits, K. WINDISCH and K. BOEHM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, pp. 347–352*).—The authors studied the kind and amount of nitrogenous constituents and sugars in fruits, as well as the amount of pectin and tartaric acid. It was found that the proportion of coagulable albumin was very small. In many cases the amount was so small that filtered fruit juice when heated remained perfectly clear. The amount of true protein estimated by the Stutzer method was also in general very small.

As regards the ammonia and amid nitrogen, relatively large amounts of these constituents and of total nitrogen were found in all the varieties of grapes examined. Much smaller amounts were found in the cherries, plums, peaches, quinces, berries, and other fruits examined. The small amount of these constituents was especially noticeable in the case of blueberries and bilberries. The authors believe that the fermentation of must is in a large measure dependent upon the kind and amount of nitrogen present, and note that the nitrogen of ammonia and organic acid amids is most readily available for yeasts.

As regards the character of the sugars present in fruits, saccharose was found in every case in apples and pears. Apparently in the case of peaches saccharose was much more abundant than invert sugar. Saccharose was also noted in mulberries, cherries, plums, peaches, and black currants, fruits which are usually referred to as saccharose-free.

According to the authors' observations, the pectin content of a number of fruits examined in general diminished as the fruit ripened. The analyses reported showed that tartaric acid in general occurs, if at all, in very small amounts in most fruits and plays a valuable rôle only in the case of grapes.

Further notes on fruit growing in Tasmania, G. QUINN (*Jour. Agr. and Ind. South Australia, 8 (1904), No. 2, pp. 69–78, figs. 7*).—Special attention is called in this article to the desirability of pruning apple and pear trees to low forms with a very short trunk and with arms subdivided until from 8 to 15 leaders are secured. The leaders are not again bifurcated, but at each winter's pruning growth from one bud only is permitted to ascend in order to continue the extension and leading

direction of the branch. Some vigorous trees are summer pruned and the formation of fruit-bearing twigs thus encouraged. It is believed that trees thus pruned are much more capable of resisting sun scald, drought, and wind storms than where the branches are not shortened in and the tree allowed to develop into long branches which bend and break when heavily loaded with fruit.

Pruning, W. J. ALLEN (*Agr. Gaz. New South Wales, 15 (1904), No. 8, pp. 798–800, figs. 3*).—Illustrations are given of the difference in appearance and the more fruitfulness of apples and pears when well pruned than when allowed to grow naturally. On the unpruned trees the bulk of the fruit is borne far out on the ends of straggling branches which are thus bent to the ground. In order to prevent the trees from being broken it is necessary to remove a large quantity of the fruit or to prop up the limbs. On well-pruned trees the limbs are sturdy and upright and the fruit is borne close to the body of the tree and no props are needed.

The stub-root system of tree planting (*Amer. Agr., 74 (1904), No. 17, pp. 345, 346*).—The experience of a number of orchardists who have planted fruit trees according to the stub-root system of pruning are here recorded. J. S. Harris reports that the system is not suited to the climate and soil of Kent County, Md. G. G. Hitchings, who planted a block of 1,000 peach trees, every alternate row being pruned according to the stub-root system, reports that the first year trees pruned in the regular way started out better and kept ahead all the season. The second year, however, the stub-root pruned trees did as well as the others, and it was difficult to detect any difference in the appearance of the trees differently root pruned. Mr. Hitchings' orchard is located in Onondaga County, N. Y.

Experimental studies in arboriculture, L. DANIEL (*Jardin, 18 (1904), Nos. 421, pp. 268–270, figs. 4; 422, pp. 276–278, figs. 7*).—The results are given of experiments in pruning pear trees by a method which the author calls *à onglet complet*. This method of pruning differs from the ordinary method in that the branch or shoot, which would ordinarily be pruned off entirely, is left on the tree and all of the buds on the branch are removed, including the top bud.

As a result of this method of pruning all of the wounds on the branch heal over. The branch remains alive for one or more seasons and requires a certain amount of food for its nourishment. It acts, then, as a kind of parasite on the tree, reducing its vigor. By this method of pruning it is claimed that more fruit is obtained than by the ordinary method, the theory being that a reduction of vigor induces fruitfulness.

A number of other phenomena caused by pruning *à onglet complet*, such as fasciation, the conversion of leaf buds into flower buds, and the abnormal swelling of certain shoots, due to bud growth, which takes place underneath the bark without bursting through, and the appearance of a second and even third crop of flower buds in the same season, are noted. Several of these abnormalities are illustrated.

Thinning of orchard fruits, C. F. AUSTIN (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 110–116*).—A discussion of this subject, with a review of the results which have been secured at the experiment stations along this line with different fruits.

The apple industry in Tasmania, W. J. ALLEN (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 815–819, figs. 3*).—An account of apple production in Tasmania, with estimates as to the cost of preparing the land for orchards and the yield of fruit which may be obtained upon an acre. The cost of clearing the land and planting the trees is placed at about $400 per acre. When the orchard comes into bearing it is estimated that the average yield will be about 300 cases per acre, which, after paying for all expenses of picking, packing, and marketing, should net about $150.

The winterkilling of Baldwins, U. P. HEDRICK (*Nat. Nurseryman, 12 (1904), No. 11, p. 141*).—The author calls attention to the failure of Baldwin apples in Michigan. At the Agricultural College 3 plantings of Baldwins have been made, but there is not now a bearing tree on the place, all having succumbed to the cold. The past

winter has been especially severe on this variety. Practically all of the trees outside of the peach region have been injured or killed, and many trees have suffered in localities where peaches have grown. In the northern counties of the State it is reported that all Baldwins have been killed. It appears to the author that the Baldwin apple is not more hardy than the peach, and should not, therefore, be grown outside of peach regions. The author believes, however, that the Baldwin apple can well be dispensed with, since there are a number of other varieties which are much more satisfactory in Michigan as a dessert apple.

The orange in northern and central California, E. J. WICKSON (*San Francisco: California State Board of Trade [1904], pp. 11, pl. 1*).—Attention is called to the desirability of northern and central California as a locality for the growing of citrus fruits. The oranges of northern California ripen in advance of those of the southern part of the State, chiefly on account of the influences exerted by the presence of the Coast Range which serves as a wind-break. Some suggestions are given on locating citrus orchards in this region.

The story of the papaw, F. B. KILMER (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 8, pp. 181–189; 2 (1904), Nos. 4, pp. 84–91; 5, pp. 113–119; 8, pp. 178–181; reprinted from Amer. Jour. Pharm., 73 (1901), pp. 272–285, 336–348, 383–395, figs. 14, map 1*).—An account of the botany, characteristics, and culture of the papaw (*Carica papaya*), with detailed results of the chemical study of the milk of the papaw, including analyses of papaw latex, papaw proteids, ferments, glucosids, and alkaloids. The analytical methods employed are noted. An account is also given of market preparations of the papaw, of experiments on the digestive action of the ferment of the papaw, and of the products of digestion by the papaw ferment.

Peach trees in winter, W. F. FLETCHER (*Country Gent., 69 (1904), No. 2693, pp. 818, 819*).—The author made an investigation of the injuries to peach trees caused by the severe weather during the winter of 1903–4. In overcoming the injurious effects of winter freezing the author found that moderate pruning, good culture, plenty of fertilizer, and a close watch on insect pests were the best tonics for a frozen tree. Trees at high elevations suffered less than those in low places. Trees having a general exposure were less affected than those in sunny, sheltered pockets. It was found that moisture in the bark of the trees during the first few warm days of early spring indicated life in the stem or roots.

Japanese persimmons, H. H. HUME and F. C. REIMER (*Florida Sta. Bul. 71, pp. 68–110, figs. 9*).—Notes are given on the history of the Japanese persimmon in the United States; the botany of the persimmon, with a classification and description of varieties, and cultural notes, including directions for propagating, fertilizing, cultivating, pruning, and marketing. Several insects which affect persimmons are described by H. A. Gossard and remedies suggested for their control. A bibliography of 46 papers on Japanese persimmons is appended.

The authors classify Japanese persimmons into light-fleshed varieties, dark-fleshed varieties, and mixed-fleshed varieties. They state that, as a rule, dark-fleshed varieties and seeds accompany each other in the case of Japanese persimmons, though Triumph is an exception to this rule. A certain correlation was found between the shape of the fruit and the shape of the seeds. An illustration is given showing the shape of the seeds of 16 varieties.

The ripening season of Japanese persimmons is such that the early varieties come into competition in the north with late peaches and grapes, and the late varieties with apples and early oranges. For home use the authors recommend varieties covering the whole season, as follows: Yemon, Tanenashi, Zengi, Costata, Triumph, and Tsuru. For commercial purposes the following varieties are recommended: Yemon, Tabers No. 129, Tanenashi, Hachiya, Hyakume, Costata, Triumph, and Tsuru.

The American persimmon (*Diospyros virginiana*) is considered the best stock for Japanese varieties, as it is larger and more vigorous than the Japanese stock. The

seed of American persimmons should be sown in seed beds and transplanted to the nursery after they have attained a height of 10 to 12 in. In the nursery it is recommended that they be set 6 in. apart in rows 2 ft. apart. Grafting rather than budding is considered advisable, and crown grafting is considered much superior to root grafting. Whip grafting is preferred to cleft grafting in Florida. The authors state that budding is not successful with the persimmon in Florida, and this method of propagation should not be employed. In the orchard Japanese persimmon trees should stand 15 to 20 ft. apart each way.

As a result of experimental work at the station it is recommended that fertilizers for the persimmon should contain 3 per cent nitrogen, 6 per cent phosphoric acid, and 10 per cent potash. They should be applied at the rate of about 5 lbs. per tree for trees 6 years old. Experiments to determine the relation of the amount of potash in the fertilizer and the dropping of the fruit of the persimmon have given only negative results. It has been noted that older trees do not drop their fruits to as great an extent as younger trees. Persimmons should be gathered when fully matured but still firm.

Shipments to a number of northern horticulturists were made of persimmons in boxes and baskets. Generally, the fruit arrived in good condition, which shows that with care there need be no difficulty in the shipment of this fruit to northern markets. Directions are contained in the bulletin for preserving persimmons.

Pineapple culture, II. Varieties, H. H. HUME and H. K. MILLER (*Florida Sta. Bul. 70, pp. 36-62, pls. 10, figs. 4*).—This bulletin classifies and describes the pineapples cultivated in this country, noting the botanical features. Pineapples are divided into 3 groups, namely, the Queen, Cayenne, and Spanish. The typical variety of the Queen group is the Golden pineapple. The fruit of this variety "is characterized by yellow flesh, pointed eyes sloping upward from the sides, deep yellow fruit, and sirupy juice; flavor rich and sweet. Plants usually not adapted to open field culture." The Smooth Cayenne is taken as the type of the Cayenne group. "The flesh is a light yellow, the eyes broad and flat, not elevated at the nipple. The leaves are smooth or serrated; the plants are strong, upright, vigorous growers." In the Spanish group the typical variety is Spanish. "The flesh is white, the eyes are flat but elevated at the corners of the bracts. The leaves are strong, stiff, and serrated."

It is stated that the varieties of pineapples cultivated in this country have been introduced from Brazil, the West Indies, India, or from the greenhouses of England. Of the varieties now grown in Florida fully 95 per cent are of the Spanish variety. At least 99 per cent of all the plantings in the State are Spanish, Cayenne, Abachi, Porto Rico, and Golden. This list contains practically all of the varieties grown for commercial purposes. "For extensive open-field culture the Spanish pineapple is the only variety which can be recommended." The other varieties mentioned may be grown in a small way in the open field, but plantations of the same are too short lived to compete with the Spanish variety. Under sheds the varieties Cayenne, Abachi, and Golden are given the preference; and of these Cayenne is considered the best. The edible portion of a number of varieties and the composition of the same varieties with reference to ash, nitrogen, sugar, juice, etc., were determined by the authors and are shown in the following table (p. 469).

Composition of pineapples.

Variety.	Average weight of fruit.	Edible portion.	Total solids.	Soluble solids.	Ash.	Nitrogen.	Available juice.	Juice.	
								Acids as sulphuric.	Total sugars.
	Ounces.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Abachi	40.0	65.3	11.98	11.40	0.41	0.056	80.7	1.05	10.55
Spanish	59.0	59.3	12.64	11.44	.46	.063	87.2	1.35	10.22
Cayenne	78.0	62.8	14.40	13.38	.42	.089	85.5	.60	13.37
Red Ceylon	58.0	57.0	10.61	8.64	.43	.076	80.0	1.03	7.73
Egyptian	29.0	50.0	16.00	14.01	.43	.052	74.6	.81	12.21
Golden	55.0	65.4	13.27	12.16	.42	.057	86.6	.62	11.98
Porto Rico	146.0	67.0	13.60	11.22	.47	.069	87.5	.76	11.61
Enville	66.0	57.5	12.45	11.16	.61	.074	79.4	.59	10.57
Prince Albert	44.0	61.3	13.66	12.25	.69	.061	84.3	1.19	11.35
Sugar Loaf	38.7	57.3	10.76	9.76	.48	.066	85.6	2.11	8.49
Rothchild	40.5	63.5	9.90	8.76	.57	.083	84.9	1.28	6.64
Wild	23.5	50.0	10.51	6.77	.75	.190	78.5	2.00	4.28

Another table is given which shows the composition with reference to sugars and acids of the various parts of the pineapple. From the figures given it is shown that the sugar decreases and the acid increases from the base to the crown of the fruit, and from the core to the circumference. The sweetest fruit, therefore, of the pineapple is at the base near the core.

Cacao manurial experiments at Grenada (*Agr. News [Barbados], 3 (1904), No. 66, p. 347*).—The amount of cacao obtained during each of the years 1900 to 1904 on plats fertilized with manure and with different quantities and combinations of commercial fertilizers are tabulated. No conclusions are drawn.

Facts as to date culture, A. V. STUBENRAUCH (*Pacific Fruit World, 18 (1904), No. 5, p. 7*).—This article was written for the purpose of cautioning intending date planters not to be too hasty in setting out large orchards in the vicinity of the Salton basin until further experimental work shall determine just what varieties will best succeed and just what difficulties may be encountered in the work.

While theoretical considerations as to summer climate may show the Salton basin to be especially well adapted to date culture, meteorological data on the winter climate have not accumulated in sufficient quantity to make certain that the trees will flourish over winter. It is believed, therefore, that intending planters should await the results of the coming winter, rather than to plant blindly and then be disappointed in the future. The purpose of the article is to arrest the booming of date culture, but not in any way to stop the development of the industry along rational lines.

Making a cranberry bog, F. A. MAKEPEACE (*Country Gent., 69 (1904), No. 2693, p. 819*).—Detailed directions are given for making a cranberry bog. After the plants have been set it is about 4 years before they come into full bearing. Once established, a good bog should bear steadily for 10 to 12 years without doing much to it other than keeping it free from weeds and the ditches cleaned out. The average annual production of an acre of good bog is placed at 100 bbls. With the cranberry picker a skillful operator will average about 10 bbls. of fruit per day.

Trial shipment of grapes to England (*Jour. Dept. Agr. West Australia, 10 (1904), No. 1, pp. 24–27*).—Different varieties of grapes were shipped to England in a number of different packages. They arrived in England about 5 weeks after picking. All of the varieties had lost their bloom and fresh appearance, and the stalks had become discolored and somewhat shriveled.

The varieties which had been packed in cork dust arrived in decidedly the best condition, those packed in paper only did not look so well, and those packed without any cork dust or covering at all were in the worst condition. For carrying purposes, therefore, the cork dust is recommended as preferable to any of the methods

tried. The grapes brought low prices, and it is not believed that fruit of this quality could be made to pay.

Keeping late grapes on the vine (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 907, 908, figs. 2*).—It was found that if the whole vine, grapes and all, was covered with heavy bagging while in full leaf, the grapes could be preserved for a much longer time than when the bunches were cut off with a small portion of the cane and the stem inserted in a bottle of water. This method, however, was a failure in wet seasons because the fruit remained damp within the bags for so long that it rotted. It is believed, however, that if the upper portion of the bag is covered with rubberoid so that the fruit may be kept dry this trouble may be avoided.

Investigations on the development and composition of varieties of grapes cultivated in Abraou-Durso, G. Barberon and F. Changeant (*Ann. Soc. Agr. Sci. et Ind. Lyon, 8. ser., 1 (1903), pp. 97–159, dgms. 6*).—Abraou-Durso is a province of Russia bordering the northeast coast of the Black Sea. Considerable wine of good quality has been produced there within recent years, and the authors made an extensive study of the composition of the skins, pulp, seed, juice, etc., of a large number of these varieties, all of which is presented in an extensive series of tables.

The quantitative determination of organic phosphorus compounds in grape seeds and natural wine, J. Weirich and G. Ortlieb (*Arch. Pharm., 242 (1904), No. 2, pp. 138–143*).—The presence of lecithin, which has been found in seeds by a number of investigators, led the authors to investigate its presence in grape seeds and in natural wine. This was found in considerable quantities in the seeds of a variety of grapes from Thyra, and also in sweet wine of high alcohol content made from these grapes.

When the seeds were extracted at a temperature much above 50° C. the organic phosphorus compounds were destroyed. From the data secured in this experiment the authors draw the conclusion that, in the handling of wine, heating above this temperature may destroy the lecithin in it and thus decrease its value for consumption. In wines low in alcohol content a very small amount or perhaps no organic phosphorus compounds may be found.

The presence of lecithin in wine, A. Rosenstiehl (*Arch. Pharm., 242 (1904), No. 6, pp. 475–477*).—The author calls attention to the insufficient data upon which Weirich and Ortlieb (see above) based their work in determining the lecithin content of wine, and of certain other important factors which they failed to take into account.

Notes on rubber plants (*East Africa Quart., 1 (1904), No. 3, pp. 127–129*).—East Africa rubber is obtained primarily from the various Landolphia vines. These vines usually grow on good soil in damp or shaded situations and are found at elevations from sea level up to 8,000 ft. On account of its climbing habit, however, Landolphia is not well adapted to cultivation. The rubber from a number of species has been submitted to the Imperial Institute, London, and a valuation placed upon the product.

A valuable new almond (*California Cult., 23 (1904), No. 19, p. 462*).—The new almond described originated as a chance seedling by a Doctor Simmons, of Sacramento. It has a hard shell and is of large size and excellent flavor. It is claimed for it that it is so hardy as to withstand any ordinary frost. It has proved a certain bearer for a number of years, yielding each season a very heavy crop. If these claims are substantiated it will make a valuable addition to the list of almond varieties.

Chestnut culture, J. W. Kerr (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 34–38*).—Contrary to the general belief that chestnuts will not grow on limestone land, the author states that Japanese chestnuts are successful wherever corn can be grown. The Japanese variety is advised for market purposes. The trees should be set about 25 ft. apart, and when 7 or 8 years of age should produce about a bushel of nuts per tree. The trees should be planted on ground that can be cultivated in order to better control insect pests.

Trees and shrubs tested in Manitoba and the Northwest Territories, W. SAUNDERS (*Canada Cent. Expt. Farm Bul. 47, pp. 50, pls. 6*).—In this bulletin the results are given of a large number of trials of trees and shrubs grown at the experimental farms at Brandon, Manitoba, and at Indian Head in the Northwest Territories during the past 16 years. The matter contained is a summary of the data which have appeared in the various reports from these stations. The object in compiling the bulletin has been to present in convenient and condensed form an account of the hardiness and desirability of different trees and shrubs for ornamental purposes about the home. While the testing has been done at these 2 farms in western Canada it is believed that the results are applicable in the East, since plants hardy enough to endure the climate of the Northwest may be planted with assurance of success in any of the eastern parts of Canada.

Species of the following shrubs and trees have proved hardy in the Northwest: Juneberry, barberry, birch, Siberian pea tree (Caragana), hackberry, virgin's bower, dogwood, native hazelnut, cottoneaster, hawthorn, broom (Cytisus), Elæagnus, hop, honeysuckle (Lonicera), matrimony vine, Neillia, poplar, wild cherry including sand cherry, *Pyrus baccata*, *P. prunifolia*, American mountain ash, oak, buckthorn, sumach, native currants, gooseberries, raspberries, willows, Buffalo berry, Spiræa, lilac, elm, arrowwood (Viburnum), the grape (*Vitis vulpina*), balsam, spruce, and tamarack.

Species of the following plants have proved partially hardy, that is, they may be killed back to the ground, but spring up each season, or may be only partially killed back: Alder, birthwort (Aristolochia), southernwood (Artemisia), bittersweet, hydrangea, privet, moonseed, ironwood, Periploca, mock orange, roses, elder (Sambucus), linden (Tilia), and pine.

The following species failed: Maples, horse-chestnuts, tree of heaven (*Ailantus glandulosa*), Akebia, false indigo (*Amorpha fruticosa*), hornbeam (*Carpinus*), hickory, chestnut, catalpa, button bush, *Cercidiphyllum japonicum*, *Colutea arborescens*, Deutzia, weigelia, spindle tree, *Exochorda grandiflora*, beech, greenwood, honey locust, Kentucky coffee tree, walnut, butternut, mulberry, American plane tree or buttonwood, tamarisk, and *Salisburia adiantifolia.*

Native ornamental plants of New Mexico, E. O. WOOTON (*New Mexico Sta. Bul. 51, pp. 40, pls. 12*).—The author makes a plea for the use of native plants for shade and ornament about the homes in New Mexico, and gives descriptions of a large number of coniferous and deciduous trees, shrubs, vines, and other plants which may be used for these purposes, with directions for handling them.

Third annual convention of the Chrysanthemum Society of America (*Amer. Florist, 23 (1904), No. 858, pp. 597, 598*).—An account of the proceedings of the society at its meeting held in Boston, November 3 to 5. Score cards for judging commercial chrysanthemums and chrysanthemums for exhibition purposes were adopted. For commercial purposes the weighting of the different points was as follows: Color 20, form 15, fullness 10, stem 15, foliage 15, substance 15, size 10. For exhibition blooms color, stem, and foliage were given 10 points each; fullness, form, and depth 15 points each, and size 25 points.

The book of the iris, R. I. LYNCH (*London and New York: John Lane, 1904, pp. XII + 214, pls. 37*).—This is the twenty-first number in the series of handbooks of practical gardening, edited by H. Roberts. Part 1 gives a description of the structure of the flower and its natural history. Directions are given for the culture of the various irises. Chapters are included on hybrids and hybridizing, diseases, and insects. Part 2 is devoted to a classification and descriptions of the various species, with cultural notes under each species.

Injurious effects of manure, U. P. HEDRICK (*Amer. Florist, 23 (1904), No. 856, p. 530*).—The author calls attention to the injurious effects which sometimes follow a heavy application of manure to flower beds, due to the fumes of ammonia arising

from the manure. An instance is cited in which a large bed of asters and Shasta daisies was thus blighted within 12 hours after the manure was applied. In another case seedling honeysuckles were badly injured by an early fall application of stable compost.

Experiments in these two cases indicated "that the injurious effects of ammonia from compost could be counteracted by immediately wetting plants and manure, or by mixing a considerable quantity of dry earth with the manure to absorb the ammonia." The author considers it doubtful whether it is often necessary or profitable to apply sufficient quantities of manure to growing plants to thus injure them. An instance of injury from this cause to chrysanthemums in pots is noted and of a bed of lettuce under glass which suffered more or less from the same cause.

Experiments with lawn grasses, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1903, pp. 492, 493*).—A report is given of the conditions of the grass plats, which have been maintained at the station since 1896. The condition of these plats, which are 9 in number, shows that the Rhode Island bent grass has maintained its rank as the most satisfactory species for lawn grasses for 4 years. The Kentucky blue grass is also very satisfactory, the other species proving less adapted to their surroundings, and the red top and perennial rye seem to be unsuited to their conditions.

FORESTRY.

Report of the committee on forestry, 1903, J. T. ROTHROCK (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 509–513*).—It is claimed that the forestry policy of Pennsylvania is safely established, and for some time will be confined to an extension of what has already been begun. Work has been carried on in the propagation of forest seedlings and considerable transplanting of these seedlings has been done.

Attention is called to a recent law which authorizes the establishment of buildings for the purpose of training State foresters. The object of this school is to train men in any branch of forestry, and during the year 15 students were enrolled, who devoted half their time to study and the other half to forest work, which consisted in a considerable degree of patrolling the reserves to protect against fire, trespassing, etc. This is believed to be the first mounted State guard that any State possesses for its rural districts.

Forest thinning and its results, W. F. HUBBARD (*Forestry and Irrig., 10 (1904), No. 7, pp. 313–319, figs. 2*).—An account is given of some results of forest thinning, the illustrations of systematic thinnings being drawn from the forest belonging to the Forest Academy at Tharand and at the Austrian station in Mariabrunn. In the first case the stand was principally Scotch pine and in the second Austrian black pine. The stand of trees per acre, diameter, height, volume, etc., are given, showing not only the standing timber, but the amount removed from time to time.

Based upon these observations, the author draws some conclusions relative to forest thinning in this country, and he applies the classification to American conditions with some modifications. An illustration is given showing the proposed thinning of a 27-year-old stand of white pine.

Street forestry, F. SHONNARD (*Yonkers, New York: Department of Public Works, 1903, pp. 48, pls. 13*).—A report is given on the selection, planting, cultivation, and care of street shade trees, and particular attention is paid to the injuries to trees from electric and gas services.

An experiment is reported in which the author investigated the injurious effect of illuminating gas by introducing the gas at the rate of 1.07 cu. ft. per hour into a large pot containing a growing lemon tree. The effect of the gas on the foliage was noticeable on the third day, and on the eighth day the leaves were curling and dropping from all parts of the tree and sap was being exuded in a considerable quantity from the bark on its trunk and branches. At this time the gas was turned off, the tree

removed from the pot, and the gas-saturated soil washed from the roots. Similar tests are being carried on to determine the essential facts of gas injury to trees.

Forestry and close settlement, P. MacMahon (*Queensland Agr. Jour., 15 (1904), No. 2, pp. 599–603, figs. 4*).—An account is given of Australian forests in which the relation of forestry and population is discussed. With a total area of 2,945,991 sq. miles in Australia proper, there is a forest area of 150,000 sq. miles, amounting to about 5 per cent of the total area, while the extent of land that has been alienated or appropriated in various ways amounts to but little more than 6 per cent of the total area. If these figures be continued to include all of Australasia, the proportion is increased about 1 per cent.

A discussion is given of the forest area in relation to population of different portions of Europe, and statements made regarding the distribution of forest species, number of trees grown per acre under different systems of management, etc.

Forest fires (*Forestry and Irrig., 10 (1904), No. 9, pp. 433, 434*).—During the month of August disastrous forest fires occurred in Montana, Oregon, and Washington, the long-continued drought coupled with the very hot summer having made conditions very favorable for fires. The extent of the fires, cause where known, and loss are shown. During the same period extensive fires are reported from various parts of British Columbia, Newfoundland, and elsewhere, the fires in British Columbia being pronounced the most destructive since 1896.

Forest fires in Maine (*Forestry and Irrig., 10 (1904), No. 8, pp. 376, 377*).—An outline is given of investigations which have been carried on by the Bureau of Forestry in cooperation with the State of Maine in studying the causes and results and means of prevention of forest fires.

Ornamental and useful subtropical trees, T. R. Sim (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 8, pp. 776–779, pls. 6*).—Descriptions are given of a few tropical and subtropical trees which have proved adapted to the coast district of Natal and which are believed to be worthy of more extended cultivation than they now receive. Among the species described are the date palm, banyan, cocoanut palm, mangosteen, screw pine, rubber trees, flamboyant or royal Poinciana, etc.

Reforesting mountain slopes, T. P. Lukens (*Water and Forest, 4 (1904), No. 3, pp. 1–4, figs. 3*).—The work which is contemplated by the Bureau of Forestry of this Department in reforesting portions of southern California is described. Notes are given from various sources comparing the value of forests as a protective agent against erosion; comparisons made of the run-off of forested and nonforested lands, and the various efforts that have been made to reforest the region about San Bernardino and Los Angeles, Cal., are described.

An object lesson in reforestation, A. W. Tourgée (*Forestry and Irrig., 10 (1904), No. 8, pp. 354–361, figs. 5*).—An account is given of the methods by which the Landes and adjoining districts of France have been restocked with the maritime pine. Nearly 700,000 acres of forest are now under cultivation which were formerly barren wastes or sand dunes.

Indirect influence of forests, H. Lafosse (*Ann. Sci. Agron., 2. ser., 1902–3, II, No. 2, pp. 288–312*).—Some of the indirect influences of forests, such as effect on temperature, as wind-breaks, as means of protecting water supply, mechanical effects of roots on rocks and soils, the effect on health, etc., are discussed.

Forest planting in western Kansas, R. S. Kellogg (*Forestry and Irrig., 10 (1904), No. 7, pp. 321–326*).—The forest planting which was begun along the border of the Great Plains a good many years ago is said by the author to have resulted in abundant success. The most extensive early plantings were on the so-called timber claims, which were generally failures on account of the selection of improper species and neglect. A close examination of the results obtained leaves little room for doubting the success of forest planting in western Kansas if the species are intelligently selected and properly cared for.

Notes are given on the choice of location, methods of planting, cultivation, etc. For upland planting under ordinary conditions the author recommends the honey locust, Osage orange, Russian mulberry, and red cedar, followed by white elm, green ash, hackberry, and Scotch and Austrian pines, where these species can be properly cared for. For valley plantings, where the roots will eventually get the benefit of permanent water, all of the upland species are said to be excellent, and in many localities cottonwood, box elder, soft maple, black walnut, and hardy catalpa may be added. Under favorable conditions, where growth is rapid, Osage orange, black locust, Russian mulberry, and hardy catalpa may be profitably planted for commercial returns.

Forestry in the Michigan State Agricultural College (*Forestry and Irrig., 10 (1904), No. 7, pp. 326–329, figs. 3*).—An outline is given of the course of forestry, which was put in operation at the Michigan Agricultural College September, 1902. The forestry course extends over 4 years and the schedule of subjects pursued in the last 2 years is given in detail.

Experimental forest in Minnesota, C. C. ANDREWS (*Forestry and Irrig., 10 (1904), No. 8, pp. 379, 380*).—A description is given of the experimental forest of 20,000 acres which the State of Minnesota has set aside as an experimental forest. This consists of third and fourth rate land and has been selected on the Vermillion Range, about 12 miles from the town of Ely.

Forest-tree seed collecting in New Mexico, W. H. MAST (*Forestry and Irrig., 10 (1904), No. 7, pp. 309–312*).—An account is given of the author's experience in collecting forest-tree seed, principally western yellow pine, in New Mexico. The various tree seeds selected were piñon pine, red and white fir, limber pine, blue spruce, western yellow pine, and one-seed juniper. The methods for collecting each of these species of seed are described at some length, and a table is given which shows the amount of seed collected and the cost per pound of each species. The cost ranged from 23 cts. to $1.47 per pound.

Forest conditions in western Wisconsin, L. H. PAMMEL (*Forestry and Irrig., 10 (1904), No. 9, pp. 421–426, figs. 3*).—The early history of the forests in western Wisconsin is traced, and statements given regarding their present condition. The author divides the region into different formations, describing the characteristic soils and the more important species occurring in the different formations, and also the important shrub and herbaceous plants associated with the different forest trees. The formations described are the river formation, sandy uplands, valley formation, ridge formation, and tamarack formation.

The black wattle (Acacia decurrens), E. HUTCHINS (*Agr. Jour. Cape Good Hope, 25 (1904), No. 3, pp. 277–280*).—An account is given of the various attempts which have been made to cultivate the black wattle in Cape Colony and elsewhere. While it has been frequently claimed that the black wattle will grow in the poorest soils, according to the author experiments have shown that while the soil may be deficient in plant food it must be moist and open. A number of plantations of this tree have been made in different parts of Cape Colony and where the rainfall has been sufficient the growth has been very satisfactory. Where rainfall is not abundant but irrigation can be followed, equal satisfaction has been experienced.

The author concludes with statements taken from an account of black wattle cultivation in Natal, in which it is stated that in 1903 there were 25,000 acres of black wattle in cultivation. The cultivation of this tree was first begun about 20 years ago, and the production of bark now amounts to nearly $500,000 annually.

The poplars, L. BRETON-BONNARD (*Le peuplier. Paris: Lucien Laveur, 1903, pp. VIII+213, pls. 2, figs. 97*).—The poplar, according to the author, is next to the oak the most valuable tree for general cultivation in France. The monograph which he has presented gives an account of the history of these trees and their distribution,

and describes their culture, uses, diseases and insect injuries and their remedies, exploitation, products, etc.

After a general discussion of the botanical characters of the genus, descriptions are given of about 20 species and varieties which are either indigenous or introduced in France. Chapters are given on the reproduction, planting, culture, etc., and special attention paid to numerous fungus and insect enemies of the tree. The volume concludes with accounts of the various products and their utilization, and with directions for the evaluation of standing timber.

The study of the red gum (*Forestry and Irrig., 10 (1904), No. 7, pp. 333–335*).—An outline is given of recent investigations of the Bureau of Forestry of this Department on the value and utilization of the red gum. The rapid growth, occupation of swamp lands, and immunity from fires attracted attention to this tree as a means of continuing the lumber supply for certain uses. In spite of its abundance, this tree has been slow to be recognized of commercial importance, largely on account of the extent to which it warps and stains in seasoning. The Bureau of Forestry has been carrying on investigations at its timber-testing laboratory to determine more fully the value of this timber in comparison with higher-priced material.

The results obtained so far show that the red gum may serve for carriage and wagon wood stock in place of hickory, and it is believed that experiments will determine methods of seasoning which will overcome the warping and twisting that result from the ordinary drying of the timber. Field studies are being carried on in a number of localities, and a careful study of second growth and stand per acre will be made in the hopes of securing data that can be made the basis of recommendations for the proper management of hard-wood bottom lands.

The water elm, J. Jensen (*Forestry and Irrig., 10 (1904), No. 8, p. 384*).—A brief account is given of the occurrence in Michigan of the water elm (*Zelkova acuminata*), a species indigenous to the mountain region of Japan. This tree was introduced in 1879, a number of specimens being planted at the South Haven Substation. The largest tree measures 3 ft. 10 in. in circumference 3 ft. from the ground and is more than 20 ft. in height. This rate of growth for a 24-year-old tree is believed to show the possibilities of this species of forest tree where climatic and soil conditions are favorable to its growth. The larger specimens have already ripened seeds as is evidenced by numerous seedlings observed in hedges near by.

Camp life at the Yale Summer School of Forestry, Q. R. Craft (*Forestry and Irrig., 10 (1904), No. 9, pp. 427–431, figs. 3*).—A description is given of the location of the Yale Summer School of Forestry at Milford, Pa.; its advantages pointed out, and brief outlines of the courses and methods of instruction given.

SEEDS—WEEDS.

The biology of the seed of species of Inga, A. Borzi (*Rend. Roy. Accad. Lincei, 1903, pp. 10; abs. in Bot. Centbl., 95 (1904), No. 22, pp. 578, 579*).—An account is given of some observations on the seed of a number of species of Inga, which the author states are naked embryos without the usual seed coats.

The covering of the seed consists of a white sugary pulp which easily separates from the black seed. The seed enveloped in this pulp is carried in the long pods and is scattered more or less by birds seeking the pulp. The naked embryos are able to retain their germinative power for a considerable time and by special physiological and biological adaptations are protected against excessive radiation, transpiration, etc. The external portions of the embryos are provided with thickened cuticularized tissues containing tannin and anthocyanin. The aeration of the seed is secured by a mechanism which corresponds to the micropyle of ordinary seeds. A number of other important analogies between this peculiar seed and normal seeds are pointed out.

Rules and apparatus for seed testing (*U. S. Dept. Agr., Office of Experiment Stations Circ. 34, rev. ed., pp. 24, figs. 11*).—This is a revised edition of Circular 34 (E. S. R., 9, p. 143), which describes the rules and apparatus for seed testing, the present edition giving special attention to the description of improved apparatus, more specific directions regarding sampling, and more definite information regarding the seed bed, temperature, duration of test, etc. This circular is the work of a committee appointed by the Association of American Agricultural Colleges and Experiment Stations at its meeting in November, 1903.

Experiments with seeds and seedlings, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1903, pp. 510–517*).—During the period covered by this report experiments were made with squash and other seeds to determine the time required for the germination of various cucurbitaceous seeds. In connection with the germination tests a study was made of the method by which the thick seed coats are removed and the young plant emerges from its covering. The effect of mutilating squash seeds and of the mutilation of corn on germination is reported upon, and a brief account given of the germination of Martynia or Unicorn plant seed.

Experiments with weeds, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1903, pp. 498–504*).—A report is given on the condition of the various weeds in the weed belt which has been maintained for 7 years, and the relative rank of the different species is practically the same as noted in the previous report (E. S. R., 15, p. 159).

Extended notes are given on a species of Galensoga, which has become a troublesome weed in New Jersey, and an account is given of the black nightshade (*Solanum nigrum*) and notes given on its reputed poisonous properties. An account is also given of the broom rape (*Orobanche ramosa*) as a parasite on tomatoes grown in the greenhouse.

Report of the botanist, 1903, W. A. BUCKHOUT (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 587–590*).—A description is given of a number of weeds which have become troublesome, among the more persistent ones being the horse nettle, hop clover, sheep sorrel, field cress, and *Galinsoga parviflora*. This weed, which has been recently introduced, probably from South America, seems to be slowly spreading in moist ground throughout the State. A suggestion is made for eradication of weeds in fields, lawns, etc., and brief notes given on a number of plant diseases.

Prickly pear extermination (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 7, pp. 716–718*).—A description is given of what is called the Queensland system of prickly pear extermination, which consists of the use of a sodium-arsenate spray made by combining 4 lbs. of white arsenic and 3 lbs. of washing soda in 1 gal. of water. After boiling for half an hour the solution is used at the rate of 5 to 8 oz. added to 1 gal. of water.

The destruction of wild mustard, ROUSSILLE (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 6, pp. 451, 452*).—A brief account is given of a comparative test of power and hand spraying apparatus for use in combating the wild mustard. The herbicide used in each case was composed of 4 kg. copper nitrate to 100 liters of water. This was applied at the rate of from 800 to 1,000 liters per hectare, and was used successfully for the destruction of the weed without any injury to the crop, which in this case was oats.

All the forms of apparatus tested proved satisfactory, particularly the hand machines, which were adapted to use on a limited area. Iron sulphate, when used at the rate of 300 kg. mixed with 200 kg. of plaster, applied to a hectare, gave very unsatisfactory results.

Destruction of wild mustard, TRIBOULET, ROMMATIN, and SAINT-QUENTIN (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 6, pp. 461–466*).—The results of experiments with copper and iron sulphate solutions, and the use of the same in powdered form for the destruction of wild mustard and wild radish in growing crops, are given.

DISEASES OF PLANTS.

Some bacterial diseases of plants prevalent in Ontario, F. C. HARRISON and B. BARLOW (*Ontario Agr. Col. and Expt. Farm Bul. 136, pp. 20, figs. 12*).—An account is given of the fire or twig blight due to *Bacillus amylovorus*, a bacterial disease of beans due to *Pseudomonas phaseoli*, a soft rot of white turnips, cauliflowers, and cabbages, a rot of Swedish or yellow turnips, and a bacterial rot of stored celery.

The fire or twig blight, which affects pear and apple orchards, is described at considerable length, and notes given on the distribution of the disease, losses attributed to it, symptoms of the disease, life history of the organism causing it, and suggestions for its prevention.

The bacterial disease of beans described affects the wax beans grown largely for canning purposes. The disease begins at the margin of the leaf, or where it has been injured by insects, winds, or hail, and gradually a yellow spot appears, which spreads slowly, the diseased tissues finally becoming brown and almost black. Inoculation experiments have shown that the cause of this trouble is the organism *Pseudomonas phaseoli;* and for its prevention it is recommended that healthy seeds be used in planting, to be treated as a precautionary measure with water heated to 122° F. for 10 minutes, or soaked for a short time in a corrosive sublimate solution, 1 part to 1,000 of water. When the disease has made itself apparent the cultivation of beans in that soil should be abandoned for several years, as the organism is believed to be able to remain in the soil for some time.

The soft rot of white turnips, cauliflowers, cabbages, etc., is attributed to the organism *Bacillus oleraceæ*. This organism produces in these plants a sof. rot which causes considerable loss in the fields. A more extended account of this disease is given elsewhere (see p. 480).

The soft rot of Swedish or yellow turnips is caused by an organism quite similar to the one causing the soft rot of white turnips, but is subject to slightly different conditions. For the prevention of this disease it is recommended that the roots be thoroughly ripened and cured before being placed in storage. In order to secure this result the harvesting of the root crop should be delayed as long as possible, and after pulling the roots they should be allowed to dry before being stored.

A brief description is given of a rot of stored celery which was observed at the agricultural college during the winter of 1903–4. From a number of the decayed stems cultures were made and 2 varieties of *Pseudomonas fluorescens* were isolated. One variety causes the stems to become brownish or amber colored in rotting, while the other shows a greenish-blue color. Fresh celery plants inoculated with the organism after a few days showed the presence of the rot, indicating that these organisms were its cause. As precautionary measures for preventing the rot the authors recommend that celery should be packed with the roots in clean soil, which should be kept moist but not wet, and the atmosphere of the soil or storage room should be kept at a uniformly low temperature, but little above the freezing point.

Investigations at the station of plant pathology, G. DELACROIX (*Bul. Soc. Mycol. France, 19 (1903), Nos. 2, pp. 128–145; 4, pp. 342–355*).—Notes are given on a number of investigations carried on at the laboratory under the direction of the author. Among them are discussed the conidial form of the black-rot fungus, an apple-tree canker due to *Sphæropsis malorum*, a monstrous form of ergot, a disease of guavas caused by *Glœosporium psidii*, n. sp., a mildew-like disease of mulberries caused by *Ocularīopsis ulmorica*, n. sp., and the parasitism of *Dothichiza populea* on several species of poplars.

Letters on diseases of plants, N. A. COBB (*Dept. Agr. New South Wales, Misc. Pub. 666, 2. ser., pp. 133, pls. 11, figs. 132*).—This is a compilation, with additions and emendations, of papers by the author on this subject, which were published from time to time in the *Agricultural Gazette of New South Wales.*

The West Indian anthracnose of cotton, L. LEWTON-BRAIN (*West Indian Bul., 5 (1904), No. 2, pp. 178–194, figs. 7*).—The presence of an anthracnose of cotton has been long known in the West Indies and has been frequently identified as identical with the cotton anthracnose of the United States. Recent investigations of the author have shown the occurrence of this disease over quite a considerable portion of the British West Indies, but it so far does not seem to have occasioned any very great destruction of the cotton bolls. The symptoms of the disease are described, as well as the results of cultures and artificial inoculations with the fungus.

Studies of the organism have led the author to conclude that while not specifically distinct, the form occurring in the West Indies differs so constantly in some of its spore characters as to warrant its description as a distinct variety, the name *Colletotrichum gossypii barbadense*, n. var., being given it. Suggestions are given for combating the fungus, which include the burning of all refuse about cotton fields, treatment of seed with a week solution of corrosive sublimate, selection of seed from healthy plants, etc.

Streptothrix as a cause of musty oats, D. BROCQ-ROUSSEU (*Rev. Gén. Bot., 16 (1904), No. 186, pp. 219-230, pl. 1*).—The author reports having frequently noticed oats which exhaled a marked musty odor, sometimes to such an extent that animals would refuse to eat the grain, and serious loss was occasioned.

A study was made of a number of varieties and from the molded specimens a number of fungi and bacteria were isolated, but the only organism occurring uniformly throughout all the samples was a species of Streptothrix. The characters of this fungus as shown in various cultural media are described, and studies with cultures on sound oats showed the possibility of its causing the moldy odor. Comparisons are made between this and the other known species of Streptothrix, and while it approaches most nearly *S. fœrsteri*, still it can not be definitely identified with that species.

As a practical result of examination, the author found it was possible to prevent its infesting sound oats if the grain could be kept in a dry condition and not mixed with any that was musty, and that musty oats would lose this odor if heated for half an hour at a temperature of 80° C.

The study of potato rot, G. DELACROIX (*Ann. Inst. Nat. Agron., 2. ser., 3 (1904), No. 1, pp. 37–74, figs. 2*).—An account is given of an unusual outbreak of potato rot near Paris during the autumn of 1903. The atmospheric conditions were especially favorable for the development of the fungus and the losses caused by it were very great. An extended discussion of the methods of infection is given, as well as notes on the life history of the organism. Other diseases due to fungi and bacteria were observed, but to the Phytophthora is attributed all the serious injury.

In studying the disease marked differences in infection were noticed for different varieties, and differences of soil, fertilizer, moisture, etc., were found to influence the amount of disease in any particular variety. An excess of nitrogen was found to favor the activity of the fungus, while potatoes grown with potash and phosphoric acid fertilizers were less affected. Depth of planting is said to exert an influence on the spread of the disease, the conidia of the fungus seeming to be unable to penetrate the soil to a depth of more than 10 cm. The use of fungicides during the growing season is recommended, and care in the selection and wintering of seed tubers is advised.

The leaf brown of the potato, J. J. VAŇHA (*Naturw. Ztschr. Land- u. Forstw., 2 (1904), No. 3, pp. 113–127, pls. 6; abs. in Bot. Centbl., 96 (1904), No. 29, p. 67*).—A description is given of a disease of potatoes which is reported as having been common in Bohemia, northern Germany, Scandinavia, and elsewhere. In many particulars it resembles the potato rot caused by Phytophthora, but careful examination showed it to vary in a number of particulars, and the cause of the leaf spot to be *Sporidesmium solani varians*, n. var.

The effect of the fungus on the host plant, as well as its character as shown in pure cultures, is described. For the prevention of the disease the author recommends spraying the potatoes throughout the season with Bordeaux mixture at intervals of 2 or 3 weeks. After the potato harvest it is suggested that the tops should be collected and burned, and attention paid to the use of fertilizers and manures. Deep plowing of the potato field after harvest is suggested as a beneficial practice; and potatoes should not be continued in the same field for any long period of time, since the fungus is liable to become established in the soil, where it is able to pass the winter.

Some diseases of the potato, G. MASSEE (*Queensland Agr. Jour., 15 (1904), No. 2, pp. 605–607*).—A summary is given of an article published by the author in *Gardeners' Chronicle* relating to some of the diseases of the potato. Among those described are the potato rot (*Phytophthora infestans*), winter rot (*Nectria solani*), black scab (*Œdomyces leproides*), bacterial disease (*Bacillus solanacearum*), and potato scab (*Sorosporium scabies*).

Treatment of potatoes with fungicides, F. PARISOT (*Jour. Agr. Prat., n. ser., 8 (1904), No. 34, pp. 234, 235*).—In a series of experiments carried on at Rennes 4 varieties of potato were grown in different lots, one lot in each case being treated with Burgundy mixture, containing 2 per cent copper sulphate, and the others remaining as checks.

The results of the treatment showed that in the case of 3 varieties there was a difference in favor of the treated plants, varying from 7 to 50 per cent, while with the fourth variety there was a loss of 24 per cent. It appears from these investigations that spraying early or semiearly varieties is attended with good results, but when the variety of potato grown is a very late one the author's experiments showed a positive loss. These results are in line with those quoted from experiments by Aimé Girard, who found that very late varieties were less influenced by spraying than medium or early varieties.

Sugar-beet diseases, W. H. HUTT (*Utah Sta. Rpt. 1903, pp. XXII–XXVI*).—An account is given of cooperative experiments arranged with this Department in which the effect of different fertilizers in checking sugar-beet diseases was investigated. The disease in question was first noticed in 1902 and seemed to be very destructive wherever observed.

On examination of the fields a few beets were found which seemed to have resisted the disease, and these were placed in a silo with the expectation of raising strains of beets which might be immune to the disease. The rot, however, continued throughout the winter, and of several bushels which were stored but one beet remained to bear seed. As the disease did not appear at all during 1903 the experiment resolved itself simply into a test of the value of different fertilizers for raising beets.

The yellowing of sugar beets, G. DELACROIX (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 21, pp. 871, 872; extr. from Sucr. Indig. et Coloniale, 62 (1903), No. 22, pp. 13*).—A description is given of a bacterial disease of beets which has been under observation for some time. The author has isolated the organism causing the disease and studied its characters, and he proposes for it the name *Bacillus tabificans*. The distribution of the disease, its characteristics, and methods of attack are described and notes given on experiments for combating it.

As a preventive treatment the author recommends at least a 3-years' rotation of crops, the use of no seed that is 4 years or more old, the careful exclusion of all volunteer crops on fields where beets have been cultivated, and care in the application of manures that none should come from animals fed with diseased beet leaves.

A disease of asparagus, G. DELACROIX (*Extr. from Bul. Mens. Off. Renseignements Agr., 1903, pp. 6*).—The author describes a disease of asparagus which is attributed to the well-known fungus *Rhizoctonia violacea*.

Vitality of the cabbage black-rot germ on cabbage seed, H. A. HARDING, F. C. STEWART, and M. J. PRUCHA (*New York State Sta. Bul. 251, pp. 177–194, pl. 1*).—The results of investigations on the vitality of the cabbage black-rot germ on cabbage seed are given, a preliminary note on which has already been published (E. S. R., 16, p. 170). The authors found that the black-rot organism (*Pseudomonas campestris*) is capable of remaining in a living form on the seed for a considerable time, and the conditions under which cabbage seed is produced make it possible for the organism to be carried over from crop to crop. Cabbages intended for seed are usually placed in shallow trenches at the approach of freezing weather and covered with a few inches of soil. Here they are frozen in and remain until spring. In the spring the plants frequently show the effect of the organism, and observations made in the field show that seed plants are often more or less attacked and the organisms are found adhering to the seed. The bacteria have been isolated and experiments show that cultures of organisms isolated from the seeds are capable of producing a typical form of the black rot.

A careful study of the conditions attending the growth and harvesting of cabbage seed has led the authors to the belief that practically all the cabbage seed produced on Long Island is infested to some extent. Experiments have shown that the germs are able to live upon the dry seed and retain their vitality from 8½ to 11 months.

Experiments with seed disinfection showed that soaking the seed in a solution of corrosive sublimate or of formaldehyde would destroy the organisms without seriously affecting the germination of the seed. This treatment is recommended, but it must be kept in mind that it is only a preventive treatment and that, if plants are set in infected soils, the treatment will have but little value.

A bacterial disease of cauliflower and allied plants, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Bul. 137, pp. 32, figs. 12*).—During the summer of 1901 in the vicinity of Guelph complaint was made of a rot of cauliflowers, and shortly afterwards the same disease was noticed in a number of other localities. Later it was found attacking varieties of turnips, the loss in some cases reaching as high as 64 per cent. The disease was constantly associated with an organism which was isolated, and inoculation experiments made with it showed that it would produce the characteristic rot.

The morphological characters of the organism, which is designated as *Bacillus oleraceæ*, are given, as well as the results of an extended series of inoculation experiments, which showed the susceptibility of a number of allied plants to attacks of this bacillus. The cultural characters of the organism, as shown on a large number of media, are described and the conditions affecting the spread of the disease are stated. Warm weather, combined with excessive moisture, rankness of growth, abundance of insect pests, injuries from planting, all contribute to the spread of the disease. Marked differences are noted in the susceptibility of varieties to the disease, and a list is given of varieties of turnips in which the percentage of rotted roots is shown for different varieties.

The sleepy disease of tomatoes (*Jour. Bd. Agr. [London], 11 (1904), No. 5, pp. 300–302*).—A description is given of a disease of tomatoes due to *Fusarium lycopersici*. The fungus causing this disease flourishes in the soil and is known by 3 distinct stages, which are briefly described. For treatment it is suggested that all diseased plants should be removed and burned and, where possible, the soil should be sterilized. The use of lime on infected soils is recommended, and also that great care be taken in selecting healthy plants and securing plenty of air, light, and room for their development.

Black spot of the apple, D. MCALPINE (*Dept. Agr., Victoria, Bul. 17, pp. 32, pls. 19, figs. 2*).—This is said to be a revised edition of a previous publication, noted elsewhere (E. S. R., 14, p. 775).

The disease in question is due to *Fusicladium dendriticum*, and an account is given

of its appearance in Australia, the susceptibility of varieties, symptoms and time of attack, losses due to the fungus, conditions favoring the disease, etc. In addition, the results of experiments in spraying for the control of this disease are given, and directions for the preparation and application of fungicides. The experiments have shown that this disease may be readily prevented by the thorough use of Bordeaux mixture, for which purpose a 6-4-40 formula is preferred.

The witches' broom of plums, C. Bossu (*Rec. Biol. Expt. Appl. Agr., 1 (1901–1903), pp. 387–390; abs. in Bot. Centbl., 96 (1904), No. 34, p. 186*).—A description is given of the witches' broom of plums, due to the fungus *Exoascus institiæ*. The malformation described seemed to be restricted to plums of the Damson type, and the mycelium is readily traced through the bark parenchyma, phloëm, xylem, and medullary rays.

For combating the disease it is recommended that the witches' brooms should be cut out, the twigs being cut back at least 50 cm. below the malformations. The wounds should be treated with a solution of iron sulphate, after which they should be covered with coal tar. As a means of preventing the spread of the disease the trees should be sprayed several times with Bordeaux mixture.

The coffee disease in Oaxaca, A. L. Herrera (*Bol. Com. Par. Agr., 2 (1904), No. 5, pp. 207–276, pls. 8*).—A summary of information regarding a rust of coffee due to the fungus *Stilbella flavida*. The information given is derived from various sources, as well as the investigations of the commission that were carried on in Oaxaca and other parts of Mexico. In addition to the above-named fungus other species are considered. The value of Bordeaux mixture for the control of leaf diseases of this character is pointed out.

Progress of cranberry spraying experiments, C. L. Shear (*Proc. Amer. Cranberry Growers' Assoc., 35 (1904), pp. 6–8*).—This is a report on the experiments which are being conducted by the Bureau of Plant Industry of this Department for the prevention of cranberry scald or rot, by the use of Bordeaux mixture. At the time the report was made the indications were that from 75 to 90 per cent of the fruit on the sprayed plats was free from rot.

In an experiment reported by E. H. Durell, acting under the direction of Mr. Shear, a small bog of about 3 acres was overflowed June 6. As the water entered the bog about 20 lbs. of sulphate of copper per acre was dissolved in it. Up to the time of the report the bog showed an unusual absence of rot, indicating that the treatment had been effective. The treatment killed the fish in the stream.

Two new grape pests in Hungary, G. de Istvánffi (*Ann. Inst. Cent. Ampélol. Roy. Hongrois, 3 (1904), No. 1, pp. 55, pls. 3, figs. 15*).—The author describes 2 new parasites of the grape, the stinkhorn fungus (*Ithyphallus* [*Phallus*] *impudicus*) and an acarid (*Cœpophagus echinopus*). Both attack the roots of the grapevines, causing a very considerable loss.

The stinkhorn fungus has usually been considered as a saprophyte, but its frequent occurrence in many vineyards and on numerous varieties of grapes has led the author to conclude that the fungus has acquired a parasitic habit. Thus far the fungus has been found only on vines grown in sandy soils, and in Hungary it has 2 distinct periods of development, the aerial forms appearing in May and later toward the end of August, continuing until late in the autumn. The habit of the fungus, methods of growth and attack, effect produced on the host plant, etc., are described, and for its prevention burning infested vines and the fruiting bodies of the fungus wherever found, watering about the vines with a solution of calcium bisulphid, together with a renewal of the soil about the vines, are recommended.

In addition to grapes the fungus is known to attack the roots of the black locust, honey locust, and other plants. The mite mentioned is briefly described and notes given on its distribution, habits, etc.

The brunissure of grapes, L. RAVAZ (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 3 (1903), No. 2, pp. 145–156; 3 (1904), Nos. 3, pp. 175–251; 4, pp. 286–327, pls. 2, figs. 41*).—This is an extended account of investigations by the author on the cause, nature, and prevention of brunissure, preliminary statements regarding which have been noted elsewhere (E. S. R., 15, p. 591; 16, p. 272).

The history of the disease and various theories regarding its causes are reviewed, and the author's experiments are described at length. As previously stated, the author claims that this disease is not of parasitic origin, but is due to an impoverished condition brought about by overbearing or other causes. The author states that neither scale insects nor mites can cause it, and that *Plasmodiophora vitis* and *Pseudocommis vitis* of various authors are not fungi but conditions in which there is a disintegration of the chloroleucites and cell contents.

In addition to overbearing, the presence of mildews, black rot, and other fungi, by weakening the plant, may favor the appearance of brunissure. Pruning, fertilizing, cultivating, etc., by increasing the vigor of the vines, tend to protect them from disease. As a rule, young vines are more subject to the disease than older ones.

Notes on the gray rot, E. OUSTRI (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 29, p. 64, pl. 1*).—A brief description is given of the gray rot of grapes caused by *Botrytis cinerea;* and for its prevention the author recommends the application to the vines of a mixture of hydraulic lime 65 kg., precipitated sulphur 25 kg., and sublimed sulphur 10 kg. This mixture is said to have given excellent results in combating the fungus. It is economical and easy of application.

Development of the black-rot fungus, P. VIALA and P. PACOTTET (*Rev. Vit., 22 (1904), Nos. 552, pp. 33–36; 553, pp. 61–64; 554, pp. 89–92, fig. 1*).—The results of an extended series of investigations on the development of the black-rot fungus (*Guignardi [Læstadia] bidwellii*) are given. The methods of obtaining and propagating the cultures are described at length, and the effect of temperature, moisture, toxic agents, etc., on the growth and reproduction of the organism are fully noted.

Notes on the black rot, A. PRUNET (*Rev. Vit., 22 (1904), No. 561, pp. 289–291*).—The dependence of the fungus on the spring rains for the spread of the primary invasion is pointed out, and a discussion given of the bearing this has on the proper application of fungicides for the control of the disease. The primary invasion is confined principally to the leaves and makes its appearance early in the season. In the secondary invasion the fungus attacks the fruit. The vines which escaped the primary invasion are less subject to secondary attacks.

Macrophoma reniformis on grapes in Algeria, L. TRABUT (*Rev. Vit., 22 (1904), No. 558, p. 217*).—The author reports the occurrence of *Macrophoma reniformis* on Chasselas grapes in the markets of Algiers. This fungus has been reported in Italy, Russia, and various other places, but has not hitherto been recognized as occurring in Algerian vineyards.

Culture and development of the grape anthracnose fungus, P. VIALA and P. PACOTTET (*Rev. Vit., 22 (1904), Nos. 555, pp. 117–121; 556, pp. 145–150, figs. 10*).—The authors have isolated and studied the fungus (*Sphaceloma ampelinum*) causing the grape anthracnose, and give the results of their studies. It is claimed that the fungus, which has been known only from its conidial stage, is improperly classified, and it is referred to as a new genus and the name *Manginia ampelina* given it.

Puccinia polygoni-amphibii and Æcidium sanguinolentum, H. VANDERYST (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 5, pp. 219–222*).—Studies of the rusts commonly found on various species of geranium and Polygonum have convinced the author that *Æcidium sanguinolentum* and *Puccinia polygoni-amphibii* are different forms of the same heterœcious fungus.

A new species of Thielaviopsis, L. PETRI (*Nuovo Gior. Bot. Ital., 1903, No. 4, pp. 582–584; abs. in Bot. Centbl., 95 (1904), No. 22, p. 592*).—A description is given of a new species of Thielaviopsis, which has been observed by the author on the roots

of Podocarpus. The fungus, which greatly resembles *T. ethacetica*, the cause of the so-called pineapple disease of sugar cane, has been given the name *T. podocarpi*. The organism has been cultivated on a number of different media and its chief characteristics are described.

Report of the botanist, 1902, W. A. Buckhout (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 220–222*).—The principal inquiries of the botanist during the year reported upon were in relation to weeds and weed eradication.

In addition a number of plant diseases were investigated, and a brief account is given of a disease of ornamental white birch, which was accompanied by an abundant exudation of red or brown slime that had a very offensive odor. Diseases of this kind have been known in Europe, but they seem to be imperfectly understood. They appear to be the result of some mechanical injury, but sometimes occur where there is apparently no definite cause. Without having more information the author did not feel warranted in making recommendations for treatment.

Plant diseases in Denmark, 1903, E. Rostrup (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 395–424*).—The report contains the usual review of plant diseases appearing in Denmark during the year 1903.

Plant pathological experimental work and its aims, F. K. Ravn (*Tidsskr. Landbr. Planteavl, 11 (1904), pp. 376–394*).—An address delivered before the Royal Agricultural Society of Denmark, with discussion.

ENTOMOLOGY.

Report of the entomologist, J. B. Smith (*New Jersey Stas. Rpt. 1903, pp. 557–659, figs. 32*).—A marked decrease in the numbers of insects injurious to asparagus was noted during the year under report. An account is presented of various plant lice injurious to shade trees, ornamental plants, fruits, and garden vegetables. The San José scale still requires more time and energy for its control than all other orchard pests combined. While the insect occurs on many forest trees the author has not observed serious infestations on such trees. In one locality the San José scale was attacked by the fungus *Sphærostilbe coccophila*. Notes are also presented on a number of other scale insects, leaf hoppers, ladybirds, codling moth, nut weevils, household insects, and pests of potato, tomato, and cabbage.

The author states that the Chinese mantid has apparently become well established in various parts of New Jersey, but is nowhere very numerous. The Chinese ladybird still maintains itself in small numbers, but it can not yet be stated definitely that it will thrive under outdoor conditions. One serious parasite of this insect was noted and was identified as *Syntomosphyrum esurus*. Kerosene emulsion with milk or soap is no longer used extensively. Crude oil is still employed where it is most effective, but in a somewhat limited way as compared with previous years.

Lime-sulphur-salt wash is gaining in popularity. The author recommends a formula containing 50 lbs. each of lime, sulphur, and salt per 150 gal. of water. Some success has been had in the preparation of this mixture without boiling. In such cases some form of caustic potash or soda is used. Calcothion was used with quite satisfactory results, but the effects were somewhat irregular. A detailed account is given of insecticide operations in the author's experiment orchard.

The economic relation of birds to agriculture is discussed at some length, and attention is called to the fact that the beneficial effects of birds in the destruction of injurious insects have been frequently overestimated. In discussing the robin, the author states that "there is not a single species [of insect] of economic importance eaten by the bird which can not be easily kept in check by the horticulturist." A report is also made on a mosquito investigation in New Jersey. The migrating habit of *Culex sollicitans* has been fully demonstrated.

Further breeding experiments are being carried on to determine some of the doubtful points in the life history of mosquitoes. Estimates made by reliable engineers indicate that a thorough and satisfactory scheme of drainage can be put in operation in mosquito-ridden localities for comparatively small outlays.

Department of entomology, E. D. BALL (*Utah Sta. Rpt. 1903, pp. XXVIII–XXXII*).—Notes are given on the progress of the author's work in combating codling moth, especially a commercial test of spraying for this insect which has been undertaken but is not yet complete. In these experiments Paris green is used without the addition of lime.

An investigation was also made of the grasshopper situation, particularly in San Pete and Sevier counties, where it was found that large numbers of grasshoppers had been caught by means of the "ballooning" method for bounty. At the town of Chester 46,429 lbs. of grasshoppers were received for bounty. An estimate of the number of grasshoppers in the masses which were received was made with the result that a ton of grasshoppers is believed to contain 32,000,000 individuals. Brief notes are also given on tent caterpillars.

About some injurious insects, S. ONUKI and H. NAKAGAWA (*Imp. Agr. Expt. Sta. Japan, Bul. 30, pp. 152, pls. 14*).—This bulletin is accompanied with an English abstract of 11 pages in which the main points are summarized. The authors present biological and economic notes on a considerable number of miscellaneous insects injurious to rice, pear, mulberry, and tea. Experiments were also carried on with insecticides.

It was found that *Lema flaviceps*, a leaf-eating beetle injurious to rice, could be destroyed in the larval condition by dusting with a mixture of 1 part pyrethrum to 4 parts lime. The adult insects, however, were not affected by this treatment. Good results were also obtained in controlling this insect by the use of Paris green and kerosene. Various insecticides were tested on a species of sawfly, which is injurious to the common rush used in making mats. Pyrethrum and lime proved effective in destroying this species. It was also found that the larvæ could be destroyed by burying them in mud at a depth of 5 to 8 in.

The woolly aphis was effectively exterminated by a treatment during winter with kerosene of the strength of 5 per cent. In the experiments of the authors the pear-tree psylla was most easily destroyed by a mixture of kerosene and water at the rate of 1 to 15.

Reports on economic zoology, F. V. THEOBALD (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 113–185, pls. 10, figs. 16*).—An account is given of the life history and habits of various ticks with especial reference to their agency in spreading malignant jaundice in dogs, heart water in sheep, Texas fever in cattle, and louping ill in sheep.

An elaborate discussion is also given of the insect pests of the raspberry with notes on their habits and life history and the means of preventing them. Attention is also called to certain birds which feed upon this fruit. The author discusses briefly some of the results thus far obtained from the use of lime-sulphur-salt wash and recommends a formula containing 40 lbs. lime, 20 lbs. sulphur, and 15 lbs. salt per 50 gal. of the wash. The animal pests of forest trees are discussed in considerable detail with especial reference to the insects injurious to ash, alder, aspen, beech, birch, and horse-chestnut.

The beetles of Central Europe, L. GANGLBAUER (*Die Käfer von Mitteleuropa. Vienna: Karl Gerolds Son, 4 (1904), pt. 1, pp. 286, figs. 12*).—The author continues his monograph on the beetles of Central Europe giving analytical keys for the determination of species and detailed descriptions of species, with brief notes on their occurrence and habits. The families considered in this part of the author's work are Dermestidæ, Byrrhidæ, Nosodendridæ, Georyssidæ, Dryopidæ, Heteroceridæ, and Hydrophilidæ.

Beetle pests (*Pul. Dept. Agr. Jamaica, 2 (1904), No. 10, pp. 217, 218*).—Notes are given on injuries to rose trees and other plants caused by the attacks of *Antichira meridionalis* and also on the depredations of *Oncideres pustulata* on beech.

Bactericidal properties of the body fluids of worms, L. JAMMES and H. MANDOUL (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 4, pp. 329–331*).—In a study of various species of Ascaris it was found that the fluids produced by these worms had no effect upon pathogenic bacteria. The lesions produced by such bacteria were formed as quickly and in as great extent after the bacteria had been subjected to the action of the juices of Ascaris as before. The fluids produced by species of Tænia, however, appear to contain a soluble bactericidal substance capable of influencing the growth and virulence of pathogenic bacteria to a considerable extent.

Notes on entomology, N. BANKS (*Science, n. ser., 20 (1904), No. 500, pp. 155, 156*).—Brief notes on recent entomological literature.

Observations made on plantations in east and west Usambara, A. ZIMMERMANN (*Ber. Land- u. Forstw. Deutsch-Ostafrika, 1 (1903), No. 4, pp. 351–381, pl. 1, figs. 2*).—The author describes briefly the general conditions of plantations, especially those devoted to coffee, with reference to the most important insect pests and fungus diseases. Among the latter, especial mention is made of *Hemileia vastatrix*.

A considerable number of injurious insects were observed attacking coffee, the most important of which was the leaf miner *Cemiostoma coffeellum*. This insect is described in its different stages, and an outline was presented of its life history and its attacks upon coffee. Brief notes are also given on other insects and nematode worms injurious to coffee.

Cheimatobia brumata and means of combating it, G. LIND (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 3, pp. 253–272, figs. 8*).—This insect causes considerable damage to fruit trees almost every year. Notes are given on its habits and life history and on the best means for combating it. It is recommended that fruit trees be sprayed with Paris green at the rate of 50 gm. per 100 liters of water to which 150 gm. slaked lime are added. This mixture should be applied to the trees when the leaf buds are first opening, again when the petals are falling, and a third time about 10 days later. Sticky bands and other obstacles placed on the trunk of the tree may serve to prevent the females from laying their eggs.

Notes on the migratory locust (Acridium peregrinum), W. CARTWRIGHT (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 3, pp. 81–89*).—The life history of this insect in its various stages is briefly discussed. According to the author's observations the period of incubation of eggs appeared to be about 21 days. It was found that simple exposure of eggs to the sun for a period of one hour at a temperature of 88° F. was sufficient to kill them. This may be readily brought about by a thorough plowing. The young nymphs may be successfully combated by the use of a system of trenches and sticky obstacles. Brief notes are also given on birds which feed upon this pest.

Lantana insects (*Queensland Agr. Jour., 15 (1904), No. 3, pp. 655–657*).—Lantana has spread rapidly in many districts of Queensland and has proved a very noxious weed.

In Mexico a number of insects are known to attack the plant to such an extent as to greatly prevent its spread. Some of these insects have been introduced into Hawaii where lantana is also a serious pest. Ten species were introduced but failed to establish themselves. They died either during shipment or subsequently as a result of insect parasites or fungus diseases. Brief notes are given on the results of the importation of other species which withstood the hardships of transportation. These insects appear to be able to check lantana to some extent but not to destroy it.

The aleurodids or mealy-winged flies of California with reference to other American species, FLORENCE E. BEMIS (*Proc. U. S. Nat. Mus., 27 (1904), pp. 471–537, pls. 11*).—This family of insects is found rather plentifully represented in parts

of California, and many of them are of considerable economic importance. A general account is given of the external anatomy, life history, and habits of this group, together with analytical keys and detailed descriptions of the species.

The Mexican cotton-boll weevil, W. NEWELL (*Georgia State Bd. Ent. Bul. 12, pp. 29, figs. 21*).—The cotton-boll weevil is described in its various stages, and notes are given on various other phases of the weevil problem, such as the rate of increase and destructiveness of the pest, artificial remedies, the relation of birds to the boll weevil, insects frequently mistaken for this pest, and the quarantine law of Georgia regarding the boll weevil.

The cabbage worm, M. L. MERRITT (*Iowa Agr., 5 (1904), No. 3, pp. 86, 87*).—Notes are given on the habits and life history of *Pieris rapæ*. In combating this insect a dust spray of Paris green at the rate of 1 part to 25 parts air-slaked lime is recommended. A satisfactory liquid insecticide may be prepared so as to contain 5 lbs. pulverized resin, 1 lb. concentrated lye, 1 pt. fish oil, and 5 gal. water. This stock material after boiling for 2 hours is to be diluted at the rate of 1 gal. per 16 gal. of water.

The discovery of the native home of the San José scale in Eastern China and the importation of its natural enemy, C. L. MARLATT (*Pop. Sci. Mo., 65 (1904), No. 4, pp. 306–317, figs. 8*).—A popular account is given of the author's travels in China and Japan, together with notes on the agency of *Chilocorus similis* in controlling the San José scale.

The morphology, classification, and systematic position of Anoplura with notes on insect orders, G. ENDERLEIN (*Zool. Anz., 28 (1904), No. 4, pp. 121–147, figs. 15*).—Notes are given on the anatomy of the various parts of the body of Anoplura with especial reference to the importance of these characters in the scientific system of classification. An analytical table is given to assist in the identification of various families and genera of lice, a number of which are described as new.

The bearing of these studies upon the general classification of the orders of insects is indicated. In this connection attention is called to the great confusion which has resulted from the continual introduction of new names for insect orders.

List of the Tabanidæ (horseflies) of North Carolina, C. S. BRIMLEY and F. SHERMAN, Jr. (*Ent. News, 15 (1904), No. 8, pp. 270–275*).—A list of horseflies reported in this paper is based on collections made by the authors during the past 2 years and covers species captured at various altitudes from sea level to 4,000 ft.

The habits of adult mosquitoes of the genus Anopheles in relation to hydraulic engineering, E. PERRONE (*Atti Soc. Studi Malaria, 5 (1904), pp. 49–64*).—The breeding habits of mosquitoes are briefly noted, with especial reference to artificial waterways as breeding places for mosquitoes and as means of draining such breeding places. The beneficial effects of draining have been noted in a number of localities.

An acarid parasite of Anopheles, H. GROS (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 2, pp. 56, 57*).—Specimens of *Anopheles maculipennis* were captured with a small parasite attached to the body. The parasite possesses a round, ill-defined form of a reddish or violet color. Notes are given on the structure of the organism, which may prove to be a true parasite, or is, perhaps, more correctly considered a commensal organism.

Acarid parasites of Anopheles, EDMOND and ÉTIENNE SERGENT (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 3, pp. 100–102*).—It was found that the acarid parasites observed attached to the bodies of *Anopheles algeriensis* may become transferred to *A. maculipennis* if the 2 species are kept confined in the same cage.

A new species of tsetse fly (Glossina decorsei) from Central Africa, E. BRUMPT (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 13, pp. 628–630*).—This species is described as new and brief notes are given on its habits and life history. The bite of

the fly is said to be painful and produces a pruritis which exists for some time. The insect lives like related species on blood and is believed to be equally pathogenic with *G. morsitans*, *G. pallidipes*, and other related species.

A revision of American siphonaptera or fleas together with a complete list and bibliography of the group, C. F. BAKER (*Proc. U. S. Nat. Mus., 27 (1904), pp. 365–469, pls. 27*).—The present monograph is the result of about 14 years' work on this group, during which time the author has received assistance from various entomologists. The characteristic features of the anatomy of fleas are briefly noted and the basis of classification is explained. Analytical keys are given for the determination of species, and an extensive bibliography of papers dealing with this subject is presented.

Display of bees at the World's Fair, F. N. BERTHE (*Iowa Agr., 5 (1904), No. 3, pp. 79, 80*).—Brief notes on the nature and purpose of the exhibits in apiculture at the World's Fair at St. Louis.

The bee and the orchard (*Queensland Agr. Jour., 15 (1904), No. 3, pp. 639, 640*).—A brief discussion is presented of the agency of bees in pollinating orchard trees. The question whether bees injure sound fruit is also considered with particular reference to the orange. Apparently oranges are not attacked by bees until the skin has first been perforated by some other insect.

A preliminary investigation into the cause of the infectious bee disease prevailing in the State of New York, V. A. MOORE and G. F. WHITE (*Rpt. New York State Dept. Agr., 10 (1902), pp. 255–260, pls. 2*).—The infectious bee diseases in New York are referred to under the names "black brood," "foul brood," and "pickle brood."

An investigation of a number of cases of "black brood" showed that *Bacillus alvei* was present in every instance, while in outbreaks of "pickle brood" and "foul brood" this organism was not found and no micro-organisms were definitely identified. The authors are inclined to believe that there is but one infectious disease, namely, "foul brood," which appears under the three forms.

Silk culture, C. W. WOODWORTH (*California Sta. Circ. 12, pp. 6*).—Silkworms have been raised for many years in California, but not with profit except for a brief period, when there was a European market for silkworm eggs from California. The present circular is issued for the information of correspondents who are interested in silk raising. The station is making experiments for the purpose of determining whether it is possible to reduce the cost of producing raw silk in California. Little hope is expressed, however, of much success in this line.

Cocoons that yield colored silk, J. C. COVERT (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 287, pp. 36–38*).—An account is given of the experiments conducted by Comte and Levrat in Lyon, France, in attempting to influence the color of silk by feeding silkworms colored food. It appears that the main purpose of these experiments was not to gain any great commercial advantage in the natural coloring of silk, but to determine why some breeds of silkworms produce white silk while others yield a yellow or yellowish-green silk.

According to the experiments it seemed that the coloring matter of the cocoons was identical with that found in the leaves, and further experiments showed that the coloring matter introduced into the intestines of silkworms may have an influence upon the color of the silk produced. Silkworms were fed on leaves dipped into different colored liquids, and it was found possible to produce in this manner silk of a beautiful red color. Further experiments along this line will be carried out.

The natural coloration of silk, A. CONTE (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 25, pp. 54, 55*).—This is a controversial article in which the author combats the opinion of J. Villard, who maintained that the green coloration of the silk of *Antherea yamamai* and of *Rhodia fugax* was not due to chlorophyll.

The natural coloration of silk, R. Dubois (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 27*, *pp. 201–203*).—A controversial article in which the author replies to the contentions of A. Conte.

Silk industry in Japan in 1903 (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 287, pp. 13–15*).—Statistics are given showing the total trade of Japan in silk in 1902–3, the growth of the export of raw silk in Japan, and other matters relating to the silk industry.

FOODS—NUTRITION.

Food inspection and analysis, A. E. Leach (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. XIV+787, pls. 40, figs. 120*).—In preparing this comprehensive work the author has had in mind the requirements of public analysts, as well as other officials who are intrusted with carrying out the provisions of State and municipal laws dealing with the suppression of food adulteration, and naturally special prominence is given to the nature and extent of the adulteration of various foods, methods for the analysis, the detection of adulterants, and to the details of food inspection.

Considerable space is also given to the general composition of foods, and analytical processes, which are suited to the needs of the sanitary chemist and others who might wish to determine the proximate composition of food materials, are considered. The processes of manufacture of cereal breakfast foods, infant foods, and other classes of food materials, especially those likely to contain impurities, are briefly described. Considerable attention is paid to the use of the microscope in connection with the examination of foods and condiments, a feature of the volume being the reproduction of a large number of photomicrographs made in the author's laboratory, illustrating powdered pure foods and food products and powdered adulterants, types of adulterated foods chosen from samples collected in the course of inspection work, and permanently mounted sections of foods and adulterants.

The volume contains numerous references to the work of other investigators and similiar bibliographical data, as well as a complete index, and is also provided with standard tables and similar data.

Report of the inspector of foods for export, A. A. Brown (*Jour. Dept. Agr. Victoria, 2* (*1904*), *No. 9, pp. 889–895*).—Statistical and other data are reported and discussed.

Report of the dairy and food commissioner, B. H. Warren (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 64–70*).—Information is given regarding the amounts received from fines and other data having to do with the State pure-food law and its operation.

Bread and meat, Y. Guyot (*Le pain et la viande dans le monde. Paris: Guillaumin & Co., 1904, pp. 49*).—In this article, which is reprinted from *Revue du Commerce, de l'Industrie et de la Banque*, the author discusses the available supply of meat and cereal grain, and its adequacy if the proper amount were generally consumed, the whole question being considered from the standpoint of economics. According to the author the available grain and meat supply of the world is insufficient, and better economic conditions are needed. The article contains some references to early food investigations.

The nitrogenous constituents of flesh, H. S. Grindley (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 9, pp. 1086–1107*).—Extended studies of the nitrogenous constituents of meat are reported. The general conclusions drawn were in effect as follows:

A considerable proportion of raw flesh food is soluble in cold water, the data showing that 12.14 per cent of the total proteid of raw flesh and 22 per cent of the total nitrogen was thus soluble. "The nitrogen existing in cold water extracts of raw meat is equally divided between proteid and nonproteid substances. The acid-

ity of a solution of flesh increases upon the coagulation of its proteids. The proteids of cooked meat are much less soluble than those of raw flesh in cold water and 10 per cent sodium chlorid solution.

"Cold water extracted 3.06 per cent of nitrogenous matter from raw meats and only 0.27 per cent from boiled meat. A 10 per cent solution of sodium chlorid extracted from raw meats 6.10 per cent of proteid matter and only 0.5 per cent from boiled meat. A 0.15 per cent solution of hydrochloric acid dissolved from raw meat 2.28 per cent of proteid and from boiled meat 2.30 per cent. A 0.15 per cent solution of potassium hydroxid extracted from raw meats 2.88 per cent and from boiled meat 4.84 per cent of proteid.

"Hot water removed from raw meats 0.49 per cent and from boiled meats 6.24 per cent proteid matter. Of the total proteid existing in the original raw meats 95.22 per cent was dissolved by extracting successively with the following reagents: Cold water, 10 per cent sodium chlorid solution, 0.15 per cent hydrochloric-acid solution, 0.15 per cent potassium-hydroxid solution, and hot water, while only 50.59 per cent of the total proteid of the boiled meat was thus made soluble."

The results of this investigation were embodied in a paper presented by the author at the meeting of the American Association for the Advancement of Science at St. Louis, December, 1903. (See Science, n. ser., 19 (1904), No. 481, p. 444.)

Arsenic in food stuffs, W. Thomson (*British Food Jour., 6 (1904), Nos. 66, pp. 126–129; 67, pp. 152, 153; 68, pp. 171, 172, figs. 9*).—In a paper read before the Philosophical Society of Manchester, December, 1903, the author describes experiments on the detection and estimation of arsenic by electrolytic methods as compared with results obtained by the Marsh-Berzelius process.

Arsenic in food products, V. Bordas (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 3, pp. 234–236*).—Examinations for the detection of arsenic are reported of chicory, malt, glycerol, and other products, the amounts found in some cases being sufficient to cause alarm, according to the author, if the materials are used by infants.

Alimentary origin of arsenic in man, A. Gautier and P. Clausmann (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 2, pp. 101–108; Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 25, pp. 55–58*).—Believing that the arsenic in animal tissues is indispensable and not accidental, 41 samples of animal and vegetable foods, beverages, etc., were analyzed, arsenic being found in all with the exception of beans and cabbages. It was especially abundant in the flesh of fish and crustacea. The author calculates that the daily diet would furnish 0.021 mg., or in a year 7.66 mg., an amount which is regarded as sufficient for the needs of the body.

Changes in asparagus when kept in water, K. Windisch and P. Schmidt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, pp. 352–355*).—Investigations showed that when asparagus is stored in water to keep it fresh it loses in flavor and nutritive material.

Note on mushroom catsup, J. F. Liverseege (*Analyst, 29 (1904), No. 340, pp. 208, 209*).—Analyses of mushroom catsup are reported, and the article is followed by a discussion of the manufacture of this product.

A further note on mushroom catsup, J. F. Liverseege (*Analyst, 29 (1904), No. 342, p. 283*).—Analytical data are reported. It is stated that the so-called mushroom catsup is now made from pig liver without the use of any mushrooms.

Composition and adulteration of ground mustard, A. E. Leach (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1203–1210, fig. 1*).—Analytical studies are reported of mustard and mustard hulls; mustard adulterants are spoken of, and standards of purity suggested. The author notes that pure mustard contains no starch, yet mustard hulls of all varieties show by the diastase method considerable material which reduces copper but which is not starch. The importance of a microscope in examining mustard is pointed out.

Ground mustard (water and fat-free material) should contain, according to the

author, not more than 2.5 per cent reducing material (expressed as dextrose) when treated with diastase, not more than 5 per cent crude fiber, and not less than 8 per cent total nitrogen. As shown by the microscope, it should be free from more than minute traces of starch and should not exhibit an excess of hulls over seed tissue.

The composition of chocolate varnish, F. JEAN (*Ann. Chim. Analyt., 9 (1904), No. 7, p. 258*).—A preparation used in Spain for hardening chocolate and preventing its becoming white on keeping contained 25.6 gm. gum benzoin and 6.4 gm. of an unidentified resin in 100 cc. of alcohol.

Candied honey in paper packages (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 12, pp. 679–681, figs. 4*).—Statistics are given regarding the production of honey in South Australia, and directions quoted for preparing candied honey in convenient form for marketing in paper packages, the data on the latter topic being summarized from articles which have appeared in *Gleanings in Bee Culture.*

Under favorable conditions extracted honey will granulate and become solid, so that it may be conveniently handled. If honey is stirred or agitated the granulation is hastened. The smaller the movement and slower the motion the better the results. The best results are obtained on a warm dry day. The packages should be arranged and the honey poured into them while warm. It is stated that the honey if properly treated quickly becomes solid when poured into the packages and can then be handled readily.

Roasted beet root, E. G. CLAYTON (*Analyst, 29 (1904), No. 342, pp. 279, 280*).—Analyses are reported of roasted beet root, which is used as a substitute for or addition to chicory. Judged by the values obtained, it contains a larger proportion of total mineral matter and soluble ash than is usually present in torrefied chicory, and yields more soluble ash. When treated with boiling water the percentage of sugar is also decidedly higher.

Concerning the oil from the seeds of Carthamus tinctorius, G. FENDLER (*Chem. Ztg., 28 (1904), No. 74, pp. 867, 868*).—Analytical data are reported. On account of its disagreeable taste the author believes that this oil is not satisfactory for culinary purposes, but that it might be used for the manufacture of soap and possibly for varnish, etc.

The formation of free acid in olive oil and the rancidity of this oil, R. MARCILLE (*Seifensiederzeitung, 31, pp. 630, 631, 656, 657, 671, 672, 691, 692; abs. in Chem. Centbl., 75 (1904), II, No. 15, p. 1064*).—This article has to do with the souring and rancidity of olive oil, which, according to the author, have distinct causes, the souring being principally due to the action of micro-organisms, especially molds, and the rancidity being due to the absorption of oxygen from the air. Suggestions for avoiding such changes are given with special reference to the olive industry.

Canned goods with special arrangements for heating, P. BUTTENBERG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, pp. 355–357, figs. 2*).—The canned goods described are provided with special arrangements for heating the contents without making a fire. In one case the heat is derived from so-called hard spirit contained in a receptacle attached to the can, and in the other by allowing water containing a little acetic acid to act upon unslaked lime, these ingredients being also contained in receptacles attached to the can. The goods described are designed for use where it is not practicable to heat foods over fire.

Canning pineapples, H. N. RIDLEY (*Queensland Agr. Jour., 15 (1904), No. 2, p. 554*).—In an article quoted from the *Agricultural Bulletin of the Straits and Federated Malay States* the local methods of canning and preserving pineapples are described.

Progress report on the use of native sugars for preserves, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 8, pp. 172, 173*).—Some analytical data regarding native sugars are given, and experiments are reported on their use with and without preservatives in the manufacture of jams, etc. "Our best native sugars are of high quality, but are all infected with the fermentive Torula and special treatment

is required to ensure a sterile preserve. Sulphur dioxid and calcium bisulphite appear to be the best chemical preservatives for fruit pulp, fruits in sirups, and jams made with native sugars."

The cooperative bacon-curing industry of Denmark, VISCOUNT IKERRIN, P. J. HANNON, L. J. D'ALTON, and J. J. SLATTERY (*Dept. Agr. and Tech. Instr. Ireland, Bul. 5, pp. 43, fig. 1*).—The handling, curing, and marketing of bacon by cooperative societies in Denmark is described. The industry, as thus managed, has assumed large proportions and the cooperative societies seem to be very satisfactory in their operation.

The composition of duck egg with reference to its use in the manufacture of egg noodles and similar goods, H. LÜHRIG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 181–188*).—According to the author's analyses, a duck egg on an average contains 24 gm. of yolk with 13.17 gm. dry matter, 8.13 gm. fat, and 0.205 gm. lecithin-phosphoric acid, and 36 gm. white with 4.57 gm. dry matter and 0.02 gm. fat. Numerous analyses are reported and discussed with special reference to the use of duck eggs in egg noodles and similar egg pastes, and the lecithin content of alimentary pastes as an indication of the quantity of egg used in their manufacture.

Judging egg noodles and similar goods, H. LÜHRIG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, pp. 337–347*).—Data regarding the analysis of noodles and similar goods containing eggs are reported and discussed with special reference to a similar article by H. Jaeckle recently noted (E. S. R., 16, p. 284).

Note on the chemical examination of the fruits [of ficus], O. REINHERZ (*Agr. Ledger, 1904, No. 4 (Veg. Prod. Ser., No. 80), pp. 25–32*).—Data are given regarding the composition of the fruit of the banyan tree and other sorts of ficus found in India, the use of these fruits as food, distribution of the species referred to, and related topics, as well as brief notes on the character of the coloring matter of ficus fruits.

Preserved buttermilk, a new infant food, P. SELTER (*Deut. Med. Wchnschr., 29 (1903), pp. 486, 487; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, p. 375*).—On the basis of his experience and observation, the author regards preserved buttermilk as a useful food for both ill and healthy children.

Feeding infants with whole milk curdled with rennet, THERESE OPPLER (*Inaug. Diss., Univ. Breslau, 1903; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 6, pp. 374, 375*).—Though a number of infants were nourished for several weeks or months without harm on whole milk curdled with rennet, equally satisfactory results were not obtained in all cases, and definite conclusions regarding the value of this preparation were not drawn.

Investigations on the nutrition of man, W. O. ATWATER (*Nature [London], 70 (1904), No. 1825, pp. 617, 618*).—A summary of an address before the sections of physiology and economics at the Cambridge meeting of the British Association on August 23, 1904, in which the author described briefly the nutrition investigations which have been carried on under the auspices of the Office of Experiment Stations, pointed out some of the more important results obtained and their possible application, and spoke of the importance of extending the work along a number of lines.

Filipino ration, J. F. WESTON (*Com. Gen. Subsist. [U. S. Army] Rpt. 1904, p. 29*).—The data reported show the components of the Filipino ration prescribed by the War Department.

Food and diet, S. BELOTTI (*Bromatologia. Milan: Ulrico Hoepli, 1904, pp. 251, pls. 12; rev. in Hyg. Rundschau, 14 (1904), No. 20, pp. 1001, 1002*).—The laws of nutrition and the nutritive value of the principal classes of foods are discussed in this volume, particularly the foods which are of most importance to the Italian people. Some statistics are given regarding olive products in Italy and a summary of data regarding the composition of country and town milk.

Diet tables of Italian hospitals, A. FRASSI (*Riv. Ig. e San. Pubb., Roma, 15 (1904); abs. in Hyg. Rundschau, 14 (1904), No. 20, pp. 999-1001*).—Diet tables of 55 hospitals are given and the nutritive value of the rations for different classes of patients calculated. The data presented are discussed in relation to the general question of diet.

The Japanese soldier's outfit, with notes on the rations (*British Med. Jour., 1904, No. 2289, pp. 1327, 1328, figs. 10*).—A brief description of the equipment of the Japanese soldiers. Attention is especially called to the ready boiled rice which is supplied, and the biscuits made of wheat and rice flour with a few grains of millet seed to prevent them from becoming too hard. Dried vegetables of various kinds, including sliced potatoes, carrots, beans, sliced gourd, etc., are issued, as well as tea and salt in solid cakes or cubes, and various meats and fish in tin. To diminish weight and simplify transportation problems the fodder for the horses is specially prepared by drying.

Cost of living and retail prices in the United States, G. W. W. HANGER (*U. S. Dept. Com. and Labor, Bureau of Labor Bul. 54, pp. 1129-1164, charts 21*).—A number of the charts showing the cost of living and retail prices in the United States, prepared for the exhibit of the Bureau of Labor at the Louisiana Purchase Exposition, are reproduced, and the material presented is described. The records are based on data secured in 25,440 families residing in the principal industrial localities in 33 States. (See also E. S. R., 15, p. 493).

The regulation of dietaries in hospitals and other public institutions, W. ALBRAND (*Die Kostordnung an Heil- und Pflege-Anstalten. Leipzig: H. Hartnung & Son, 1903, pp. 79; rev. in British Med. Jour., 1904, No. 2284, p. 925*).—Dietetics of institutions are discussed and dietaries proposed, particularly for patients, nurses, and officers of hospitals for the insane.

The influence of sodium chlorid on stomach digestion, BÖNNIGER (*München. Med. Wchnschr., 1904, No. 2; abs. in Zentbl. Physiol., 18 (1904), No. 8, p. 262*).—In experiments with a dog with a Pawlow fistula, sodium chlorid solution introduced into the main stomach diminished the flow of gastric juice to about 25 per cent of the quantity found in a control animal given no salt. The effect was attributed to reflex nervous action.

Human pancreatic juice, HAMBURGER and HEKMA (*Jour. Physiol. et Path. Gén., 1904, Jan., p. 40; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, p. 93*).—According to the authors, human intestinal juice contains enterokinase, amylase, sucrase, and erepsin. It is without action on lactose and cellulose, but attacks casein directly.

The fat-cleaving ferment of the intestinal juice, W. BOLDIREFF (*Zentbl. Physiol., 18 (1904), No. 15, pp. 460, 461*).—The fat-cleaving properties of the intestinal juice were not hindered by antiseptics, like calomel or thymol, while filtering the juice diminished though it did not destroy these properties. The ferment action of the intestinal juice, the author concludes, is due to a specific ferment and is not rendered active by the gall.

The effect of alcohol, sugar, and tea upon the ability of muscles to produce work, A. F. HELLSTEN (*Skand. Arch. Physiol., 16 (1904), No. 3-4, pp. 139-221, dgm. 1*).—Ergographic experiments made with a man showed that, almost immediately after taking, alcohol increased the muscular power, but after 10 to 40 minutes the power began to diminish and this effect lasted 2 hours. The reaction followed with large doses of alcohol somewhat more quickly than with small doses.

Sugar increased the muscular power, the effect being noticed about 40 minutes after the solution was taken. The favorable effect of sugar was especially noticeable when the amount of work per unit of time was considered. The effect of tea on muscular work was but slight and lasted for only a short time. The effect was noticeable almost as soon as the tea infusion was taken.

The excretion of carbon dioxid when different sorts of sugar are consumed, J. E. JOHANSSON, J. BILLSTRÖM, and C. HEIJL (*Skand. Arch. Physiol., 16 (1904), No. 3-4, pp. 263-272, figs. 5*).—Respiration experiments with men were made to determine the effect of different sorts of sugar upon the excretion of carbon dioxid. Cane sugar and levulose were found to have much the same effect. With levulose the increase was much greater than with dextrose, which would go to show that the levulose is burned more quickly in the body and stored in the form of glycogen less rapidly than dextrose.

Muscular contraction and energy, A. CHAUVEAU (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 24, pp. 1465-1470; abs. in Jour. Chem. Soc. [London], 86 (1904), No. 502, II, pp. 575, 576*).—Using a new form of apparatus, the conditions of muscular work in man can, in the author's opinion, be accurately studied. The amount of oxygen absorbed during work is very nearly proportional to the work done. When working slowly the values of the oxygen absorbed are reduced. The respiratory quotient is always increased. Both static and dynamic forms of muscular contraction were studied. In the former the muscles of the forearm worked against measured resistance without raising a weight, while in the second a weight was raised.

Observations on hygiene, A. PROUST, A. NETTER, and H. BOURGES (*Traité d'hygiène. Paris: Masson & Co., pp. 1245, figs. 204; rev. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 1, p. 95*).—One of the principal sections of this handbook is devoted to food and diet.

ANIMAL PRODUCTION.

Fodders and feeds, L. A. VOORHEES ET AL. (*New Jersey Stas. Rpt. 1903, pp. 76-122*).—Data are given regarding the analysis of commercial feeding stuffs and their market prices. The analytical data have been noted from a previous publication (E. S. R., 15, p. 288).

Changes in the composition of corn meal due to the action of molds, J. P. STREET (*New Jersey Stas. Rpt. 1903, pp. 123-147*).—The author has continued his studies of the changes brought about in corn meal by the growth of micro-organisms (E. S. R., 14, p. 380). It was found that the spores of *Penicillium glaucum* and certain bacteria are generally present in commercial corn meal and will develop spontaneously under proper conditions of moisture, from 25.42 to 38.40 per cent being favorable to the growth of mold. The maximum growth was obtained at the lower figure. Not only does an excess of moisture cause an increased growth of mold, but with this increase of mold also appears a large increase of moisture, in one of the experiments reported amounting to 68.5 per cent. The action of *P. glaucum* on the food constituents of the meal is probably due to the enzyms it secretes.

The loss of fat varied from 3.5 to 70.4 per cent, according to the amount of water present, reaching the maximum with a moisture content of 25 to 29 per cent. With a moisture content of 21 per cent there was a development of mold, only visible microscopically, but yet causing a loss of over 12 per cent of fat. The losses in total proteids were small. However, when bacteria were present this loss was very large. Not only were total proteids lost, but the chief part of this loss fell on the albuminoids, a part being converted into less valuable amido-compounds, and other portions being volatilized as ammonia.

The changes in total ash were trifling. The changes in crude fiber were small where *P. glaucum* alone was used, but in the presence of Mucor and the bacterial growth an increase of fiber from 72 to 78 per cent was observed. *P. glaucum* had practically no effect on the total nitrogen-free extract, but Mucor and the bacteria caused very great losses.

Inspection of concentrates, J. B. LINDSEY (*Massachusetts Sta. Bul. 98, pp. 35*).—The standards required by the State feeding stuff law are quoted and analyses reported of a number of samples of blood meal, cotton-seed meal, linseed meal, old and new process; gluten meal and feed, dried distillers' grains, malt sprouts, wheat middlings and bran, mixed feeds, feeds containing molasses, oats and oat middlings, rye feed, corn meal, hominy meal, corn and oat feeds, provender, oat feeds, miscellaneous starchy feeds, and a number of poultry feeds, including meat scraps, meat and bone meal, fish, bone, mashes, and meals, chick and scratching grains, and clover meal. Some data are also given regarding the market value of concentrated feeds.

It is stated that the large majority of manufacturers, jobbers, and retail dealers have fully conformed to the requirements of the feeding-stuff law. It was found that a few dealers offered their goods unbranded and unguaranteed.

Discussing the poultry feeds the author notes that there was "no product on the market which varied more in feeding value [than meat scraps], some samples having nearly twice the value of others. In purchasing preference should be given to fine ground brands of high protein content, small to medium amounts of bone, and relatively low percentage of fat, under 20 per cent rather than over."

When oats are high in price, as was the case, according to the author, during the last 6 months of the year, when the retail price was practically $36 per ton, "feeders naturally look for oat substitutes and are inclined to reduce the oat ration to a minimum and substitute hominy chop, dried brewers' and distillers' grain, and wheat bran."

Report of the chemist, W. FREAR (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 590–604*).—The composition and feeding value of dried brewers' and distillers' grains are discussed and a large amount of data on the subject given. Station analyses of dried distillers' grains are quoted.

Cactus as feed for farm animals, A. JEHANNE (*Jour. Agr. Trop., 4 (1904), No. 33, pp. 72–76*).—Data regarding the feeding value of Indian fig (*Opuntia ficus indica*) are summarized.

The forest as a source of forage for farm animals, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 8 (1904), No. 37, pp. 333, 334*).—A summary of data regarding the use of leaves and branches in the feeding of farm animals.

Pie melons as a fodder crop (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 11, pp. 620, 621, fig. 1*).—A brief note pointing out the value of stock or pie melons as a succulent feed for cattle, pigs, and poultry.

Laws regarding feeding stuffs (*Jour. Soc. Agr. Suisse Romande, 45 (1904), No. 1, pp. 14–18*).—Swiss laws regarding the sale of feeding stuffs are summarized.

Stock raising in the Philippines (*Breeder's Gaz., 45 (1904), No. 22, pp. 1047, 1048*).—On the basis of information gathered from the Bureau of Insular Affairs of the U. S. War Department, it is stated that stock raising must be built up anew in the Philippines. The location of grazing lands and other topics are briefly spoken of. "Cattle raising for the home market should be very profitable, judging from the prevailing high prices of meat in Manila and the fact that practically all the meat consumed is shipped in on the hoof from Singapore or as refrigerated meat from Australia and the United States."

Calcium phosphate as a part of a ration, V. SCHENKE (*Landw. Vers. Stat., 58 (1903), No. 3–4, pp. 291–312*).—A summary of feeding tests and other data regarding the value of calcium phosphate. The general conclusion is drawn that precipitated calcium phosphate is the most satisfactory form for adding this material to a ration for farm animals. The article includes a bibliography of the subject.

Does an excess of calcium carbonate in feed exercise an effect upon digestibility? J. VOLHARD (*Landw. Vers. Stat., 61 (1904), No. 1–4, pp. 305–312*).—From experiments with sheep fed 50 gm. calcium carbonate daily in addition to a basal ration of

hay and cotton-seed meal with a little salt, the author concluded that the material under consideration did not materially affect the digestibility of the ration.

Notes on the absorption of fat, U. Lombroso (*Compt. Rend. Soc. Biol. [Paris], 71, pp. 396–401; abs. in Zentbl. Physiol., 18 (1904), No. 13, p. 382*).—The experiments reported were made with dogs and have to do principally with the function of the pancreas in the digestion of fat.

Formation of fat from carbohydrates, M. Fischer (*Fühling's Landw. Ztg., 53 (1904), Nos. 10, pp. 368–372; 11, pp. 412–417; 12, pp. 448–455, figs. 4*).—Data regarding the formation of fat from carbohydrates are summarized and discussed, a chemical explanation of such fat formation being one of the topics taken up. The author concludes that the formation of fat from carbohydrates necessitates the presence of a certain quantity of protein and that the protein of a ration must be increased when the carbohydrates are increased in fattening providing the amount of protein is not already sufficient. In the formation of fat from carbohydrates he believes that radicals from the cleavage of protein exercise a reducing effect upon the carbohydrates. The tissue protoplasm takes part in the reaction, an abundance of the latter being necessary for the formation of fat. He calculates that 4 or 5 parts of carbohydrates to one part of protein, in excess of the amounts needed for the physiological functions of the body, are required. Some 40 to 50 per cent of these 2 nutrients is converted into fat. The most economical proportion of protein to nitrogen-free nutrients is spoken of, and the author points out that so many factors must be considered that it is not possible to fix upon a general nutritive ratio which shall always fit a given case.

Cooperative slaughterhouses in Denmark, A. H. Hollmann (*Fühling's Landw. Ztg., 53 (1904), Nos. 11, pp. 393–398; 12, pp. 440–448*).—A descriptive article.

The autodigestion of pepsin, A. Herlitzka (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 13 (1904), II, pp. 51–57; abs. in Chem. Centbl., 75 (1904), II, No. 10, pp. 784, 785*).—From experiments which are reported, the author concluded that pepsin undergoes autodigestion and is therefore to be considered as a true proteid. The coefficient of digestibility varied directly with the time of digestion.

The anaerobic gaseous exchange of animal organs and the isolation from animal tissues of an enzym causing fermentation, I, J. Stoklasa (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 6, pp. 453–483, figs. 2*).—Experiments are reported and discussed.

Dried molasses-beet-pulp, J. B. Lindsey (*Massachusetts Sta. Bul. 99, pp. 1–10*).—The method of manufacturing molasses-beet-pulp is described and analyses and the results of a digestion experiment with sheep reported. It was found that on an average of 3 trials the coefficients of digestibility were as follows: Dry matter 85, protein 64, crude fiber 84, and nitrogen-free extract 91 per cent.

In a feeding test covering 12 weeks with milch cows molasses-beet-pulp and corn meal were compared, the average milk yield per cow on the former ration being 27.7 lbs. and on the latter 29.1 lbs. On the molasses ration the total solids were 155.9 lbs. and the total milk fat 54.1 lbs., and on the corn-meal ration these values were 162.6 and 56.0 lbs. From the recorded data the author calculates that it required from 3 to 6 per cent more digestible and dry matter to make milk and milk ingredients with the molasses-beet-pulp ration than with the corn-meal ration. The proper method of feeding molasses-beet-pulp is discussed and rations including this material suggested. The author notes that successful results were not obtained when the attempt was made to feed molasses-beet-pulp to pigs, the animals uniformly refusing it. Among the conclusions drawn regarding molasses-beet-pulp were the following:

"It keeps well, will absorb large quantities of added water, has a slightly laxative effect, has proved a palatable and healthful food for dairy stock and satisfactory as a

component of a grain ration for the production of milk. It can also probably be used with good results for fattening and as a partial grain feed for horses.

"Because of its coarse mechanical condition, it will serve as a diluter for the heavier concentrates.

"It is rather inferior in nutritive effect to corn meal (probably 10 per cent)."

Feeding beet molasses and pulp to sheep and steers, L. A. MERRILL and R. W. CLARK (*Utah Sta. Bul. 90, pp. 51–65, fig. 1*).—The experience of some of the experiment stations and of private individuals in feeding beet molasses and pulp to farm animals is summarized, and tests with 6 lots of 2 steers and 6 lots of 16 sheep reported. The rations fed the sheep and steers were the same. One lot was fed alfalfa hay with beet pulp ad libitum. All the others were fed alfalfa hay with bran and shorts, the amounts varying in different cases. With 3 of the lots this ration was supplemented by beet pulp ad libitum and with the remaining lot by molasses (8 lbs. per head per day).

In the case of the steers the average daily gain per head ranged from 1.48 lbs. on a ration of alfalfa hay and beet pulp ad libitum to 2.26 lbs. on the alfalfa hay and bran and shorts, with beet pulp ad libitum. The dry matter eaten per pound of gain ranged from 8.87 lbs. in the case of one of the lots fed bran and shorts and beet pulp ad libitum with a limited amount of alfalfa hay to 13.05 lbs. on alfalfa hay and beet pulp ad libitum. The cost of a pound of gain ranged from 2.8 cts. on alfalfa hay and beet pulp to 4.93 cts. on alfalfa hay and bran and shorts.

In the case of the sheep the gains in weight ranged from 0.07 lb. per head per day on alfalfa hay with beet pulp ad libitum to 0.2 lb. on alfalfa hay with bran and shorts and beet pulp ad libitum, and the dry matter eaten per pound of gain from 8.5 lbs. on alfalfa hay with a limited amount of bran and shorts and beet pulp ad libitum to 18.06 lbs. on alfalfa hay and beet pulp ad libitum. The cost of a pound of gain ranged from 3.11 cts. in the case of the lot fed the ration containing a limited amount of bran and shorts to 5.17 cts. with the lot fed a limited amount of alfalfa hay with bran and shorts and beet pulp ad libitum.

The authors note that, when slaughtered, the steers fed beet pulp ad libitum with alfalfa hay and bran and shorts produced the best quality of meat. The loin was heaviest and the flesh fairly well marbled, firm, and juicy. The sheep fed the largest quantity of grain gave the best carcasses, but with them the profit was less than with those receiving little or no grain. Some of the authors' conclusions follow:

"Molasses fed to steers had a value of $2.35 per ton. As a sheep food it did not give the results expected. Beet pulp when fed to steers with grain and lucern had a value of from $1.66 to $2.54 per ton, and when fed to sheep its value ranged from $1.08 to $3.66 per ton. Steers that received grain made larger and cheaper gains and required less dry matter per pound of gain the latter part of the feeding period than the fore part. Steers which received only lucern and pulp made practically as good gains the fore part of the feeding period as the latter part."

A number of rations for steers composed largely of home-grown feeding stuffs are suggested.

Feeding teers, E. B. FERRIS (*Mississippi Sta. Bul. 83, pp. 1–4*).—The author states that steers pastured for 94 days during the winter on 5 acres for the purpose of manuring the land were kept at a loss. The average daily gain of the 28 animals was about 1.9 lbs. per head. One steer died as a result, it is thought, of eating poison ivy. The parking of the cattle on the light sandy soil of the substation enriched the land and improved its water-holding capacity in a very satisfactory manner.

Experiments in feeding steers, D. H. OTIS (*Kansas Sta. Bul. 124, pp. 1–30, pls. 19*).—The relative gains made by cattle of different ages were studied, calves 6 months old, yearlings, 2-year-old and 3-year-old steers being fed a ration of alfalfa hay, corn, and Kafir corn. The lot of calves contained 19 animals and all the other

lots 20 animals. In the 210 days covered by the test the gains ranged from 376 lbs. per head with the calves to 430 lbs. with the 3-year-old steers. The greatest range in the grain required per pound of gain was also found with these 2 lots, being from 5.44 lbs. to 7.94 lbs. A pound of gain was most cheaply made by the yearlings, costing in this case 5.03 cts., and was most expensive with the 3-year-old steers, costing 5.95 cts.

A lot of 10 2-year-old steers was fed corn silage, alfalfa hay, corn, and Kafir corn and a similar lot Kafir-corn stover, corn, and Kafir corn. With the former lot the total gain per head was 447 lbs. and with the latter lot 361 lbs., the grain eaten per pound of gain in the 2 cases being 6.7 lbs. and 10.1 lbs., and the cost of a pound of gain 4.91 cts. and 6.68 cts.

The author notes that with all the lots mentioned 4 lbs. of grain per 1,000 lbs. live weight was fed at the beginning of the test and the amount very gradually increased, the steers being on full feed in about 5 weeks. "There seemed to be no difference in the various lots as to the time required to get on full feed." All the animals were sold and slaughtered, data regarding the shrinkage in weight, dressing, etc., being recorded.

"The ensilage lot sold for the same price [$4.95] as the 3-year-olds, which is 25 cts. per hundredweight higher than the 20 2-year-olds fed without ensilage, but which were of the same class and quality when placed in the feed lots, and 45 cts. per hundredweight higher than the lot receiving Kafir-corn stover." The 3-year-olds showed the greatest shrinkage in hides, and the calves next. The shrinkage of hides in the other 4 lots was exactly the same. The carcasses of the ensilage lot contained the largest percentage of fat and, according to the author, were of good quality. The carcasses of the lot fed Kafir corn resembled those of grass-fed cattle. "They were fairly well fleshed, but not well covered with fat." Taking into account the total cost the calves were considered more desirable than the yearlings, though neither lot was fat enough. The 2-year-old steers were considered in very fair market condition.

The results of the test, as a whole, show that, "by feeding plenty of nitrogenous roughness (like alfalfa) and plenty of succulence (most cheaply obtained in corn ensilage), it is possible to make rapid gains and at the same time put the steers in prime condition for market.

"The results further emphasize the superior and economic value of alfalfa hay. Corn or Kafir-corn stover does not contain the nutrients required by the steer in securing best results unless the grain ration is supplemented with nitrogenous concentrates like oil meal or cotton-seed meal, which is usually costly.

"Since alfalfa is such a splendid feed, is a heavy yielder and a good drought resister, its growth can not be urged too strongly as an economical producer of beef, as well as other classes of stock which relish and thrive upon it. Alfalfa and ensilage combined furnishes a feed that can almost invariably be depended upon, no matter what the season is, and when grain fails will keep stock in good condition; and when grain is available will enable the feeder to put on gains rapidly with a comparatively small allowance of grain."

Feeding cattle with different quantities of concentrated foods (*Mark Lane Express, 91 (1904), No. 3799, Sup., pp. VII, VIII*).—Brief notes are given regarding a test at the University College of North Wales of the comparative value of limited and liberal rations of grain (maize meal and decorticated cotton-seed cake or linseed cake) in addition to pulped swedes, hay, and straw.

On the more liberal ration the average daily gain in the 50 days of the test was 2.55 lbs. per steer as compared with 2.37 lbs. on the limited ration. Taking into account the cost of food, the conclusion was reached that the extra gain did not compensate for the extra feed. Though the animals receiving the more generous ration were somewhat better in appearance than the others, the difference between

the 2 lots was not regarded as sufficiently marked to affect their relative money values.

Calf-feeding experiments with skim milk, V. JONSON (*Nord. Mejeri Tidn., 19 (1904), No. 16, pp. 208, 209*).—The results of an experiment with 8 calves here reported indicate that calves will give better returns for skim milk than pigs do.—F. W. WOLL.

Breeding and feeding pigs, D. H. OTIS (*Kansas Sta. Bul. 124, pp. 31–57, pls. 33*).—A number of points regarding feeding, breeding, etc., were studied with the station herd. Ten pigs on rape pasture (1 acre) made an average daily gain of 1.09 lbs. for 98 days, consuming 3.01 lbs. of grain per pound of gain. With a similar lot on alfalfa pasture (0.5 acre) the corresponding values were 1.10 lbs. and 3 lbs., and with a lot fed grain without pasturage 1.04 lbs. and 3.71 lbs. "The pasture is not only economical from the standpoint of gains, but it furnishes succulence and variety and keeps the hogs in a healthier condition."

When alfalfa hay was fed with grain to a lot of 12 pigs for 56 days the average daily gain was 1.2 lbs. per head and the grain eaten per pound of gain 4.65 lbs. In the case of a similar lot fed grain without hay the gain was 1.18 lbs. and the grain eaten per pound of gain 5.29 lbs.

Skim milk and buttermilk were compared with 3 lots of 6 pigs each fed respectively grain, grain with alfalfa pasturage, and grain with rape pasturage. With skim milk the average daily gain in the 77 days of the test was 1.12 lbs. and with buttermilk 1.06 lbs., the grain eaten per pound of gain being 3.11 lbs. and 3.31 lbs.

The influence of liberal feeding on runt pigs was tested with 4 animals. They were placed on rape pasture and fed a mixture of equal parts of corn, Kafir corn, and shorts, to which some dried blood and soy beans were added. In addition some grain was picked up behind steers. In the 278 days of the test the average daily gain was 0.94 lb., and the grain eaten per pound of gain 3.3 lbs. The author points out that the ration fed, together with good care, produced excellent results.

The gains made and the grain eaten by pure-bred and crossbred pigs were recorded, the best gains being made on an average at the lowest cost by the crossbred pigs, but as pointed out by the author it was not possible to include pigs of the same weight in all the lots. Some of the station's pure-bred and crossbred pigs were slaughtered and judged, but definite conclusions regarding breeds were not reached.

"Comparing the fat, medium, and lean hogs, there was found to be a great difference in the leaf lard. The sides from the lean hog were said . . . to make better bacon than the sides from the fat hog. The fat hog was considered to be more profitable from the butcher's standpoint, likewise from the breeder's standpoint, because they dressed a higher per cent. The medium hog was considered the best for bacon, but not as good as the lean hog for ham. From the butcher's standpoint the lean hog was the most unprofitable. The color of the meat was practically the same in the fat and medium hogs."

Observations are also recorded regarding the effect of size of litter on the gains made and upon the feed consumed by the dam, the effect of the age of dam on the size of litters, and the effect of following steers on the size of litters. The station dipping vat and farrowing houses are described.

Experiments in pig feeding, H. T. FRENCH (*Idaho Sta. Bul. 42, pp. 305–318, pls. 9, fig. 1*).—Several problems connected with pig feeding have been recently studied at the station. Using 2 lots, each made up of 3 Poland-China and 1 Tamworth-Poland-China, wet and dry feeds were compared for a period covering 119 days, the ration for about a month consisting of ground wheat and later of shorts and ground barley 1:2. The pigs fed the soaked grain made a total gain of 303 lbs., the grain eaten per pound of gain averaging 4.85 lbs. Those fed the dry grain gained 339.5 lbs., the grain required per pound of gain being 4.33 lbs. The author calls attention to the

fact that somewhat better gains were made on the dry ground grain, although in the majority of tests reported in this country a slight advantage has been noted with the soaked grain, especially when the grain was fed whole.

Using the same pigs as in the preceding test, the relative value of pure-bred and crossbred pigs was studied, the ration consisting of headed wheat fed ad libitum. In the 77 days of the test the average daily gain of the pure-bred pigs was 0.7 lb. and of the crossbred pigs 0.55 lb. The pigs were slaughtered and the live and dressed weight, weight of the organs, etc., recorded. On an average the shrinkage in the crossbred pigs was 23 per cent and in the pure-bred pigs 21 per cent. The author notes that no striking features were brought out by the slaughter test. The crossbred pork was considered superior for curing purposes, having a thinner rind, a larger percentage of lean, a more even distribution of fat, and a finer texture of meat fiber. In general the flesh of the crossbred pigs was leaner than that of the others and when cooked was regarded as of superior quality.

To learn something of the possibilities of feeding crossbred Tamworth-Poland-China pigs economically, a lot of 6 was fed for about a month soaked shorts, then for 2 months soaked chopped wheat, and for about a month chopped wheat and pea meal 1:2, the largest gain being made, according to the author, during the last period. In the 112 days covered by the test the average daily gain was 1.19 lbs. and the feed eaten per pound of gain 3.94 lbs. "The crossbred Tamworth-Poland-China pig for a bacon hog in our opinion is certainly a very desirable one. The pigs are thrifty from the time they are farrowed until matured." The estimated profit was $2.46 per 100 pounds live weight, not taking into account the cost of labor.

Using 9 pure-bred Poland-China pigs, the value of green peas as pasturage when supplemented by a ration of shorts and sweet separator skim milk was studied. The variety of peas selected was black-eyed marrowfats, sown May 22, and the pigs were turned on the pasture June 29. The test closed August 30, the pigs at this time having exhausted the pasturage on the one-fourth acre plat used. The average daily gain was 0.83 lb., the feed required per pound of gain being 2.15 lbs. of shorts and 4.43 lbs. of skim milk in addition to the pasturage. The author calculates that on the basis of this test an acre of peas converted into pork would be worth $59.56. "This, of course, is very large and could not be expected from any considerable area. . . . We have so far found the black-eyed marrowfat pea superior to the white Canada field pea, but conditions of soil will modify the results very much." The need of planting the peas deeply to avoid danger from drought is pointed out.

Peptone feed for pigs, W. Müller (*Fühling's Landw. Ztg., 53 (1904), No. 12, pp. 456, 457*).—Continuing earlier work (E. S. R., 15, p. 501), this brief note states that pigs given peptone feed in addition to potatoes and grain were fed at a greater profit than similar lots fed potatoes and grain only.

The nutrition of horses, J. B. Lindsey and P. H. Smith (*Massachusetts Sta. Bul. 99, pp. 11–16*).—Suitable feeding stuffs for horses, preparation of feed, watering, digestibility, and related topics are discussed and a number of rations suggested, some of which have been fed at experiment stations or by practical feeders.

"Generally speaking, 12 to 15 lbs. each of hay and grain daily are sufficient for horses of 1,200 to 1,300 lbs. weight doing moderately hard work. Should a portion of the grain consist of cotton seed, or gluten meal, it would be wise to reduce the grain ration somewhat and increase the quantity of hay. Farmers will naturally prefer to feed a maximum amount of hay and as small a quantity of grain as possible. In view of the high prices usually prevailing for oats, the feeder should aim to provide partial or entire substitutes for this grain. Mixtures of corn and bran, or corn, brewers' grains, and bran, ought to prove quite satisfactory."

Feeding horses and mules on home-grown feed stuffs, C. M. Connor (*Florida Sta. Bul. 72, pp. 115–126*).—The value of sweet potatoes, cassava, and of cane sirup as a partial substitute for corn in a ration for horses and mules was studied.

In the test with sweet potatoes 2 pairs of horses and 2 of mules, doing hard work, were used, one animal of each pair being fed corn, hay, and sweet potatoes in about the proportion of 6 lbs. of corn, 17 lbs. of hay, and 15 lbs. of sweet potatoes per 1,000 lbs. live weight, the other animal in each case receiving corn and hay only in about the proportion of 10 lbs. of corn and 15 lbs. of hay per 1,000 lbs. After 6 weeks the rations were reversed. The hay used was beggar weed of good quality. There was little variation in the weight of the animals, except that in 2 cases there was some increase when sweet potatoes were fed. In general, the sweet-potato ration was the cheaper.

"The most important fact brought out in this experiment is that sweet potatoes may be substituted for at least one-half of the corn ration, this substitution being at the rate of 3 lbs. of sweet potatoes for one of corn. This being the case, an acre of sweet potatoes yielding 150 bu. is equal to a yield of 50 bu. of corn, so far as feeding the work stock is concerned. We do not think that a horse at hard work would do well on an all sweet-potato ration from the fact that the bulk would be too great for the capacity of the stomach. . . . We have fed one mule for 3 months on sweet potatoes, cassava, and hay with good results. He was used for light work about the lot, such as hauling feed, bedding, etc."

Using 1 pair each of the mules and horses included in the previous test, the value of cassava was studied, one animal of each pair being fed cassava with corn and beggar-weed hay for 6 weeks, and the others corn and hay. The average amount of cassava eaten was irregular and in general smaller than in the case of sweet potatoes. "The animals maintained their weights throughout the experiment, which may go to show that cassava is more concentrated than the sweet potatoes. . . . Cassava may be used in about the same ratio as sweet potatoes, but is not so palatable to the animal."

At the close of the cassava test one of the mules was fed for 6 weeks a ration of corn and low-grade cane sirup and another the regular corn ration. The amount of hay eaten was not recorded, but the author states that it was about the same as in the previous tests. Small gains were made on both rations. "Both mules remained in good condition during this experiment in spite of the fact that they were doing hard plowing throughout the entire time."

The author states that sirup has been further tested in a preliminary way at the station and "that it is relished by all farm animals. In feeding, the sirup was given at night and morning and a larger corn ration given at noon. . . . Sirup may be fed to the work stock, provided it is mixed with chopped hay or something to give it bulk." As regards native hay for draft horses and mules, the author notes that considerable prejudice is felt regarding it by livery-stable men and in log camps. In his experience it has been used exclusively for 2 years, and he has never had any cause to regret its use. The chemical analysis of some of our native grasses is higher than that of timothy, "which is used almost exclusively in feeding horses."

Spanish goats, J. Crepin (*Jour. Agr. Prat., n. ser., 7 (1904), No. 18, pp. 587–591, pl. 1*).—A descriptive article including among other matters data regarding the chemical composition of milk of different sorts of goats.

Phosphated fowls, H. d'Anchald (*Jour. Agr. Prat., n. ser., 7 (1904), No. 19, p. 619*).—In an article quoted from the *Journal de la Société Royale Agricole de l'Est de la Belgique*, a test is reported in which an ordinary poultry ration was fed for 120 days in comparison with the same ration plus 4 gm. of powdered bone per day. The live and dressed weight of the chickens thus fed and the weight of the bones and organs are recorded.

The chicken fed the ground bone weighed 2.69 kg., while that fed the ordinary ration weighed 2.47 kg. The skeleton of the chicken fed ground bone weighed 0.236 kg. and that of the other 0.190 kg.

Cooperative egg and poultry societies (*Bd. Agr. and Fisheries* [*London*], *Leaflet 111, pp. 4*).—The work of the cooperative poultry societies in England and Ireland is briefly described, and the advantages which attend such organized attempts to benefit the poultry industry are briefly spoken of.

Duck breeding at Netherby, C. J. CORNISH (*Country Life* [*London*], *16* (*1904*), *Nos. 392, pp. 49–52; 393, pp. 99–101, figs. 13*).—The possibilities of raising teal, pintails, widgeons, and hybrid wild ducks in semicaptivity are discussed, and the results of experiments reported, which were on the whole successful, the whole question being considered from the standpoint of the possibility of stocking estates with game.

Experimental studies in oyster propagation, 1903, J. NELSON (*New Jersey Stas. Rpt. 1903, pp. 415–458, pls. 4*).—During the present year the studies in oyster propagation have had to do especially with the ventilation, temperature, and manipulation of the oyster spawn.

"We may summarize the factors or conditions on which success seems to depend, as determined up to the present, thus: Oysters freshly tonged, filled with spawn, consisting of ripe, clean eggs, speedily taken and fertilized, without crowding, by a small quantity of motile sperms, in well-filtered, fresh sea water taken at full flood-tide, thorough washing of the eggs, occasional agitation and good ventilation while keeping them at a temperature as near 75° as possible, with care to prevent their exposure to temperatures below 60° or above 80°. A failure in one or more of these respects proves fatal. Under the above conditions, if the fry do not reach the shell stage on the third day, counting the day of fertilization as first, it is evidence that an unknown factor foredooming to failure has influenced the experiment."

DAIRY FARMING—DAIRYING.

Report of the dairy husbandman, C. B. LANE (*New Jersey Stas. Rpt. 1903, pp. 347–411, pls. 25*).—This report deals with the soiling crops grown for the dairy herd, the record of the herd, cost of milk production, etc.

Soiling crops, 1903 (pp. 350–362).—The record is given of the yields of the various soiling crops grown for the dairy herd, the time during which they furnished feed, and the cost of production. Rye and wheat, while they did not give a large yield, supplied forage for the herd at a time when nothing else was available, and the land was immediately seeded to other crops. A record of one acre of alfalfa for 5 years showed an average yield of green forage of 19.32 tons per year, including the year it was seeded. Another acre seeded in May, 1901, yielded 11.36 tons, and a third plat yielded from 4 cuttings at the rate of 21.36 tons of green forage per acre. Crimson clover is regarded as "a very valuable plant for early forage," and peas and oats are "now considered almost a necessity by dairymen who practice the soiling system." If sown the first week in April, the crop supplies the best of forage during the month of June. The crop will not do well where the soil is acid, and hence a dressing of lime is recommended, and also a heavy dressing of well-rotted barnyard manure.

From tests of a number of varieties of millet it is concluded that "White French, Hungarian, Red Siberian, Golden, and German are not as profitable as the Barnyard (Giant) and Pearl (Pencilaria), where the object is to grow the largest amount of forage possible. Some of these varieties may, however, be better adapted for hay. Of the two other distinct varieties, namely, Barnyard and Pearl, the Barnyard has given better results as an all-around crop for the reason that it contains a higher percentage of dry matter and produces smaller and more palatable plants."

Among the cowpeas, the Red Ripper proved the best of the erect varieties and outyielded all the others; the Southdown, Small Black, and Taylor (medium trailers) also being noted as good. The Thoroughbred White Flint corn continues to be one of the best kinds for soiling purposes, owing to its succulent habit and heavy growth. Strychnin mixed with moist corn, which was then spread upon the field, proved

very efficient in destroying blackbirds which had been troublesome in the corn fields.

The arrangement of soiling crops during the season of 1903, so as to furnish a continuous supply of forage for the dairy herd from May 1 to October 20, is tabulated, together with the yields per acre of green material and of nutrients. "The total yield per acre for all crops in the year's rotation shows a profitable return. Leaving out of consideration the crops that were turned under, and the mixed grasses, which were not in the regular rotation, 6 acres yielded less than 10 tons, 11 acres yielded more than 10 tons and less than 15, 4 yielded over 15 and less than 20, while one yielded over 20 tons. The average yield per acre for the crops in the regular rotations, not including those turned under, was 12.15 tons."

Forage v. silage (pp. 363, 364).—For 7 years past the coarse fodder has consisted of soiling crops from May to November, and of silage for the remaining 6 months. A summary of the records of the dairy herd for that period "shows the average yield of milk per cow during the soiling and silage periods to be 3,402 and 3,024 lbs., respectively, a difference of 378 lbs. in favor of soiling. The average yield of butter was 171.3 lbs. for the soiling period and 154.5 for the silage period, a difference of 16.8 lbs., also in favor of soiling. The average percentage of fat for the two periods was practically the same." The number of fresh cows each month during the year was quite uniform, so that the comparison was thought to be a fair one.

Experiments with nitrate of soda on mixed grasses, rye, wheat, barley, cowpeas, and millet (pp. 364, 365).—The use of nitrate of soda at the rate of 150 to 200 lbs. per acre was accompanied by a gain in yield, ranging from 0.7 ton in the case of barley to 1.7 tons for rye, and a financial gain ranging from $1.55 on barley to $2.23 on wheat. The nitrate was most effective when applied early in the season on early crops.

Seeding grass on sod without grain (p. 365).—This practice, which is not a common one among farmers, has proved an excellent one at the station. There has never been failure to secure a good stand.

Inoculation experiments with alfalfa (pp. 366–374).—These experiments were carried on in 45 small cylinders sunk in the ground. Typical soils were obtained from 8 different localities, and these were inoculated with soil and with soil infusion. In other cases the soil was not inoculated, but received a dressing of nitrate of soda at the rate of 147 lbs. per acre. The conclusions from the first year of the experiment were as follows:

"(1) Inoculation with alfalfa bacteria in 'soil solution' and in 'soil' produced an average gain of 40.2 and 9.1 per cent, respectively, in two crops of alfalfa, over cylinders not inoculated.

"(2) All soils did not respond alike to inoculation. A variation of 0 to 83 per cent was noted in case of inoculation with 'soil solution,' and 30.7 to 43.9 per cent where the inoculation was made with 'soil.' It should be noted, however, that in the latter instance the loss of 30.7 per cent was due, in part at least, to a poor stand of alfalfa.

"(3) A wide variation was found in the natural adaptability of soils in different parts of New Jersey for growing alfalfa. A difference of 118 per cent was noted in groups of cylinders containing the different kinds of soil.

"(4) Cylinders inoculated with 'soil solution' produced 11.1 per cent more alfalfa the first season than those treated with nitrate of soda at the rate of 147 lbs. per acre, costing $3.31."

Cost of producing milk (pp. 374–377).—During the year ended April 1, 1903, the herd of 34 cows consumed grain feed to the amount of $836.85 and coarse fodder amounting to $648.80, making a total cost of food for the year of $1,485.65, an average of 11.97 cts. per cow daily. The cost of the grain feed represents what was actually paid for it; that of the hay, cornstalks, and soiling crops represents the actual cost of labor,

seed, manures, and fertilizers, the farm manures being charged at the rate of $1.50 per ton. The total yield of milk by the herd was 98,574 qt., and the cost of the feed (grain and coarse fodder) per quart of milk was 1.51 cts. The total cost of producing milk, including the cost of feed, of labor, and the interest on and decrease in the value of the herd, amounted to 2.26 cts. per quart, or $1.03 per 100 lbs. "At $1 per hundred, the price received in many rural districts, the profits from the business, if any, must be found in the manure." Allowing $1.50 per ton for the manure, in this case there would be a profit of $482.26 from the 34 cows under the soiling system.

At 3½ cts. per quart for the milk, the price which could have been received at wholesale, the receipts would have amounted to $3,450.09; deducting from this the cost of the purchased feeds, labor, interest, decrease in herd, etc., would leave a balance of $1,877.24, which would represent the value of the home-grown crops. Assuming that the dairyman does his own work, another calculation is made.

Summarizing the record of the dairy herd for 7 years, "the average yield per cow was 6,528 lbs. The average cost of food per cow per day was 12.35 cts., of which 6.41 cts., or 51.9 per cent., represents purchased feeds and 5.94 cts., or 48.1 per cent, farm crops. The average cost per quart of milk for the seven years, including food, labor, and interest and decrease in the value of the herd, is shown to be 2.37 cts."

The dairy business in relation to soil exhaustion (pp. 377–379).—Tables are presented showing the amount of fertilizing elements contained in the feeds purchased and in the milk produced by the herd for 7 years, and bring out "a decided gain to the farm in all the elements of fertility each year." It is shown that if all the milk sold from the farm was obtained from foods grown on the farm, the exhaustion of nitrogen would be in greater proportion than of the mineral elements, and that it would be necessary to supply nitrogenous fertilizers in order to maintain the fertility.

Records of the dairy herd (pp. 380–387).—The monthly record is given for each cow for the year ended April 1, 1903, and from this record and the average composition of the milk the yield of butter is calculated. The best cow produced 8,511.3 lbs. of milk and the poorest cow 3,482.4 lbs., the average being 5,952.6 lbs. In butter production the best cow produced 414.96 lbs. and the poorest 183.25 lbs., the average for the herd being 302.4 lbs.

"As in previous years, the facts brought out by this study indicate that but little if any profit can be derived from a cow that does not produce 5,000 lbs. of milk per year, particularly if the milk is sold at the low price of 1 ct. per pound. . . . The 14 cows yielding over 300 lbs. of butter paid for their food and $25.51, in addition to skim milk and manure; while the manure and skim milk of the 12 cows yielding less than 300 lbs. of butter represent the pay received for their care and the labor of making the butter, with $6.11 additional."

A study of the waste in handling and delivering milk during 7 years showed a steady decrease, which in 1903 amounted to only 0.16 per cent. The decreased waste is due largely to improved apparatus and greater care in handling the product. "While the use of bottles increases the expense of delivery, due to extra weight on the wagon, the extra work of cleaning and the breakage and loss of bottles, which amounts to about 10 cts. per day for each 100 used, the decrease in waste, greater cleanliness and better condition of the milk when delivered has more than offset this extra cost."

Cowpea hay v. purchased feeds (pp. 388–396).—In this experiment, which included 4 cows and continued for 36 days, 17 lbs. of cowpea hay was compared with a grain ration of 4 lbs. of wheat bran, 3 lbs. of dried brewers' grains, and 2 lbs. of cotton-seed meal, 36 lbs. of corn silage being fed with each ration. During the experiment 8.3 per cent more milk and 15.2 per cent more butter were produced upon the grain than on the cowpea-hay ration, and all the cows tested higher in milk fat on that ration. The cost of feed to produce 100 lbs. of milk was 39.8 cts. on the cowpea-hay

ration, and 60.5 cts. on the grain ration, and the cost of a pound of butter 8.82 and 12.06 cts., respectively.

Soy-bean silage and alfalfa hay v. purchased feed (pp. 396–402).—In this experiment 4 cows were fed for two 15-day periods to compare a ration of 36 lbs. of soy-bean silage, 8 lbs. of alfalfa hay, and 6 lbs. of corn meal, with one composed of 6 lbs. of cornstalks, 36 lbs of corn silage, 4 lbs each of wheat bran and dried brewers' grains, and 2 lbs. of cotton-seed meal. On the soy-bean silage and alfalfa-hay ration 5.81 per cent more milk was produced than on the grain and silage ration, while the yield of butter was practically the same on the 2 rations. There was a saving of 8.5 cts. per hundred in the cost of producing milk, and 1.1 cts. per pound in the production of butter when the soy-bean silage and alfalfa-hay ration was fed.

"These data are significant in showing not only the value of such home-grown crops as soy-bean silage and alfalfa hay, but also that a ration may be produced on the farm that is quite superior as a milk producer to one in which the fine feeds are purchased; at the same time it is furnished at less cost."

Cotton-seed meal v. wheat bran and dried brewers' grains (pp. 402–411).—A grain ration consisting of 4½ lbs. of cotton-seed meal was compared with one composed of 5 lbs. each of wheat bran and dried brewers' grains, 36 lbs. of corn silage and 6 lbs. of cornstalks being fed with each ration. The feeding covered 4 periods, 2 lots of 2 cows each being used.

The summary of the results shows that the amount of milk and butter produced from the 2 rations was practically the same. The cost of food per 100 lbs. of milk was 54.1 cts. on the cotton-seed meal ration and 66 cts. on the mixed grain; and of butter 11 cts. and 14.3 cts., respectively. "In other words, the results indicate that when dried grains cost $20 and wheat bran $21 per ton, the dairyman can afford to pay $42 per ton for cotton-seed meal when producing milk."

Cooperative experiments with milch cows, 1902–3, H. Goldschmidt, C. M. Kjeldsen, and J. A. Lemming (*Copenhagen, 1903, pp. 52+XVI, charts 16*).—This is an account of the first series of cooperative feeding experiments with milch cows conducted on 13 Danish dairy farms for the purpose of studying the economy and the effect on the milk production of introducing certain changes in normal feed rations met with in Danish feeding practice, in such a way that an increase or a decrease of either protein or nonnitrogenous components of the rations was supplied. The elaborate plan of the experiments and details as to their conduct are given in the report; but only a brief statement as to the main conclusions drawn by the authors can be given here.

The normal rations fed consisted of a basal portion of 0.7 lb. digestible protein and 7 lbs. calculated digestible carbohydrates (nitrogen-free extract + fat × 2.4) per 1,000 lbs. live weight, and a productive portion of 0.55 lb. of digestible protein and 1.3 lbs. digestible carbohydrates per 10 lbs. milk. This ration was found somewhat too high in both protein and carbohydrates to prove the most profitable, but on the whole may be considered a satisfactory guide to the feeder. The experiments illustrate plainly the economy of feeding in accordance with the amount of milk produced by the cows at the different stages of the period of lactation.—F. W. WOLL.

The dairy, J. Mahon (*Queensland Dept. Agr. Rpt. 1904, pp. 30–33*).—Data are given regarding the milk and butter yield of the station cattle, and a test on the feeding value of white carrots for dairy cattle is reported.

Investigations on the electrical resistance of milk, F. Petersen (*Milch Ztg., 33 (1904), No. 36, pp. 567, 568*).—The main results of the investigation may be stated as follows: The electrical resistance of normal cow's milk is dependent on its composition and on the temperature of the milk, falling with rising temperature, and vice versa. The average resistance of milk from single cows was found to range between 186 and 304 ohms at 15° C., and averaging 231.64 ohms; while that of mixed-herd milk fell between 204 and 255 ohms at 15° C.

The resistance seems to depend on individual peculiarities of the cows, other than their age or the stage of the period of lactation. It is, however, greatly increased in the milk of strippers during the last month of the lactation period, and is considerably below normal in colostrum milk, during the first days after calving. It increases rapidly from this time up to the tenth or twelfth day, after which time it again falls, and varies within the ordinary limits. The resistance of the milk increases with the progress of the act of milking, the strippings having the highest resistance of any portion of the milking.

So long as the milk does not sour its electrical resistance remains constant, but no direct correlation was found in the case of new milk between the degree of acidity of the milk, as obtained by titration with an alkali solution, using phenolphthalein as an indicator, and the electrical resistance of the milk. No difference in the resistance was observed between milk produced on pasture and that produced on dry feed, nor does there appear to be any breed characteristic in this respect.

The general average of 660 single determinations of the electrical resistance of cow's milk was 232 ohms, with a probable error of 14.28 per cent. The addition of water increases the electrical resistance of milk, although the results are not decisive when only small quantities of water are added. With the addition of 10 per cent of well water, the probability of adulteration, as shown by the results of the author, is 0.522; with 20 per cent, 0.881; with 30 per cent, 0.991, and with 40 per cent, 0.9996. There is no correlation between the resistance of milk and its specific gravity, or its content of total solids, nor does any direct correlation exist with the ash content of the milk, although a certain parallelism is apparent, especially when the ash content of the nonfatty solids is compared with the figures for the resistance of the milk.

All the milk components conducting electricity are present in the milk serum passing through a porous filter, while milk freed from its mineral components no longer conducts electricity. The electrical conductivity of the milk depends primarily on the ash of the milk, especially on the chlorids, and next on the phosphates and sulphates.—F. W. WOLL.

Splitting up of fat globules in cows' milk on agitation, C. BARTHEL (*Nord. Mejeri Tidn., 19 (1904), No. 25, pp. 331, 332*).—The author determined, by means of the Babcock method, the number of fat globules in milk before and after heating to 55° C., and churning the same for 5 to 90 minutes in a Holstein churn, run at the normal rate. An increase in the number of globules in 1 cu. mm. of milk was observed in every case when the milk had been heated and churned, the increase being larger the longer the milk was churned. While the Gottlieb method gave identical results in the case of all samples of milk, the fat content obtained by the Adams method decreased with increasing length of time churned. The following series of trials illustrates the relations observed:

Relation between length of churning and number of globules.

	Number of globules in 1 cubic millimeter.	Fat content.		Difference.
		Gottlieb.	Adams.	
		Per cent.	*Per cent.*	*Per cent.*
New milk	2,800,000	3.87	3.88	0.01
Churned 5 minutes	4,180,000	3.68	3.88	.20
Churned 10 minutes	4,800,000	3.59	3.86	.27
Churned 15 minutes	6,600,000	3.52	3.86	.34
Churned 30 minutes	10,360,000	3.49	3.88	.39
Churned 60 minutes	10,650,000	3.39	3.88	.49
Churned 90 minutes	11,000,000	3.36	3.88	.52

—F. W. WOLL.

On fat determinations in separator skim milk and buttermilk, E. HOLM (*Mälkeritid., 17 (1904), No. 14, pp. 260–262*).—A discussion of the relative merits of

the ether-extraction and the Gottlieb methods of fat determination. The author corroborates the results obtained by Barthel (E. S. R., 15, p. 1053), showing that the extraction method will give too low results in the case of milk that has been churned or subjected to considerable agitation at a temperature over 40° C.—F. W. WOLL.

Sin-acid butyrometry (*Milch Ztg., 33 (1904), No. 27–28, pp. 417–419, 436–438*).—A general description of a new method of milk analysis devised by A. Sichler, in which the nonfatty solids are brought into solution by a salt solution, the composition of which is withheld from publication. The bottles used in this method are somewhat similar to the Gerber milk-test bottles. It is accurate in comparison with the Soxhlet and Gerber methods, and is claimed to be very simple in manipulation.—F. W. WOLL.

The bacterial contamination of milk and its control, F. C. HARRISON (*Trans. Canad. Inst.; 7 (1904), III, No. 15, pp. 467–496, figs. 17*).—Practically the same as a paper abstracted from another source (E. S. R., 15, p. 183).

New bacterial species giving the aroma to butter, SEVERIN (*Messenger Imp. Russ. Soc. Acclim. Animals and Plants, No. 11, pp. 8–14; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 3, p. 415*).—The bacterium which imparts to butter the peculiar agreeable aroma is described. The experiments on the practical application of this bacterium have not yet been concluded.—P. FIREMAN.

Comparative study of the bacterial flora of Russian-Swiss and Emmenthaler cheeses, BUDINOV (*Messenger Imp. Russ. Soc. Acclim. Animals and Plants, No. 11, pp. 15–38; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 3, p. 414*).—Results of 3 complete analyses are given of two Russian-Swiss cheeses (one young and one 3 years old) and one Emmenthaler cheese. In the young Russian-Swiss cheese were found 3 species of bacteria (2 cocci and 1 bacillus), and in the Emmenthaler 6 (3 cocci and 3 bacilli). The rind proved to be in both cases poorer in bacteria than the cheese itself. The 3-year-old cheese was found entirely sterile. All the bacteria isolated were lactic-acid formers and are facultative anaerobic organisms.—P. FIREMAN.

Contributions from Dr. Johan-Olsen's dairy bacteriological laboratory, G. TROILI-PETERSON (*Nord. Mejeri Tidn., 19 (1904), No. 23, pp. 305, 306*).—A description of the method of pure yeast culture of Johan-Olsen used in the manufacture of the Norwegian cheeses Gammelost and Pultost.—F. W. WOLL.

The manufacture of dried milk, R. CROWE (*Jour. Dept. Agr. Victoria, 2 (1904), No. 9, pp. 934, 935*).—The manufacture of dried milk on an experimental scale by a local firm is described. It is said that the resulting milk powder may be mixed with water and used in the same way as ordinary milk.

Milk powder; a new industry, H. VANDERYST (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 5, pp. 233–239*).—A summary of data regarding the manufacture of dried and powdered milk.

State milking courses of 1903, and what they have taught us, O. L. DANILS (*Nord. Mejeri Tidn., 19 (1904), No. 12, pp. 152–154*).—The beneficial effects of the milking courses conducted during the year 1903, which were arranged for by the Swedish government, are commented upon.—F. W. WOLL.

Oleomargarine legislation in Denmark and other countries, H. FABER (*Mälkeritid., 17 (1904), No. 23, pp. 415–430*).—F. W. WOLL.

VETERINARY SCIENCE AND PRACTICE.

Report of the State veterinarian, L. PEARSON (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 87–158*).—The work of the office of the State veterinarian for 1903 is outlined in considerable detail. Copies are given of acts of the Pennsylvania legislature encouraging the repression of tuberculosis and preventing the spread of rabies.

A condensed statement is presented regarding the present status of glanders, anthrax, blackleg, hemorrhagic septicemia of cattle, rabies, forage poisoning of

horses, cowpox, hog cholera, mange in horses, infectious abortion in cows, milk fever, and tuberculosis. On account of the rapidity with which the symptoms of forage poisoning develop and the high rate of mortality in cases of this disease, the author mentions in some detail the conditions with regard to food and water under which this disease may develop to the greatest extent. Treatment of forage poisoning has thus far been rather unsatisfactory.

Tuberculosis still prevails in nearly all parts of Pennsylvania except the mountainous counties. Copies are given of the legal forms of requests for inspection and tuberculin tests of herds and for assistance in disposing of tuberculous cattle. The thorough application of the Bang method, or some modification of this method, is considered the most satisfactory way of eradicating this disease. Good results have thus far attended the experiments in vaccinating young cattle with attenuated tubercle bacilli in order to confer upon them further immunity to the disease. Further experiments along this line will be carried out.

Report of the veterinary service in the Kingdom of Saxony for 1903 (*Ber. Veterinärw. Königr. Sachsen, 48 (1903), pp. 348*).—This report contains an account of the organization of the veterinary service, brief reports from district veterinarians, an account of cattle and goat raising, a discussion of meat inspection, diseases of horses, and the work of the veterinary high school in the Kingdom of Saxony.

The influence of surra upon metabolic processes, R. STÄHELIN (*Arch. Hyg., 50 (1904), No. 1, pp. 77–96*).—In order to study the effect of surra upon the physiological processes of the animal body a dog was artificially inoculated with this disease. The dog had previously been studied for the purpose of determining as accurately as possible its normal digestion. The amount of nitrogen in the urine was found to be considerably less during the fever period, while the amount in the feces was increased.

During the progress of the disease increasing quantities of nitrogen and fat were decomposed. One of the most striking examples of inequality in the income and outgo was shown in the great excess of the water excreted over the quantity ingested.

Report on Bacillus violaceus manilæ, a pathogenic micro-organism, P. G. WOOLLEY (*Philippine Dept. Int., Bureau Govt. Labs.* [*Pub.*], *1904, No. 15, pp. 15, pl. 1*).—The bacillus described as new under the name *B. violaceus manilæ* was isolated from 3 carabaos which died so suddenly and with few well marked symptoms that hemorrhagic septicemia was suspected as the cause of death.

Cultures of the organism were obtained from the lymph glands and lungs. Inoculation of guinea pigs produced an infection similar to that observed in carabaos. In one case 1 cc. of a 48-hour-old culture caused the death of a guinea pig within 5 days after inoculation. The organism was found to be pathogenic also for dogs, calves, cats, and rabbits. A test undertaken to determine whether or not a soluble toxin was produced by the organism gave negative results. Dead cultures suspended in normal salt solution caused a reaction on the fifth day after the inoculation of a monkey. The blood of this animal then showed complete agglutinating power.

The penetrability of the intestinal wall for micro-organisms under physiological conditions, B. KLIMENKO (*Ztschr. Hyg. u. Infectionskrank., 48 (1904), No. 1, pp. 67–112*).—The literature relating to this subject is discussed in a critical manner in connection with bibliographical references. The author's experiments were made on dogs, guinea pigs, and rabbits, and the micro-organisms used in the experiments included *Bacillus prodigiosus, B. mesentericus vulgatus, B. kieliensis, B. pyocyaneus,* hay bacillus, acid-fast bacilli from butter, *Thyrothrix tenuis,* and *Staphylococcus citreus.*

As a result of numerous feeding experiments with these organisms under various conditions, it is concluded that the intact intestinal wall of perfectly healthy animals is not permeable for micro-organisms. The possibility is admitted of the penetration

of the intact intestinal wall in cases of general disease. Since, however, it is quite rare to find an animal in perfect health, and since the slightest pathological lesion in the animal organism, or even an insignificant mechanical injury to the mucous membrane of the alimentary tract, may make possible the penetration of bacteria, these facts must be considered of great practical significance. Apparently the organism may receive some protection against the penetration of micro-organisms from the mesenterial lymphatic glands.

The formation of antitoxins, C. BRUCK (*Ztschr. Hyg. u. Infectionskrank., 48 (1904), No. 1, pp. 113–120*).—The author's observations as reported in this article were largely confined to a study of tetanus toxin and toxoid in the organism of guinea pigs.

The results of experiments with the tetanus toxin and toxoid are presented in a detailed tabular form. From this study it appears that 3 stages may be recognized in the formation of antitoxins. In the first stage the haptophor group is formed in connection with the receptor. In the second stage there is an increased formation of receptors corresponding to the appearance of the haptophor group, and in the third stage the antitoxin proper appears as a result of a stimulus furnished by the presence of the toxophor group.

The validity of the law of multiple proportions in the reaction between toxin and antitoxin, L. MICHAELIS (*Biochem. Centbl., 3 (1904), No. 1, pp. 1–12*).—A careful study of the reaction between toxin and antitoxin indicates that the law of multiple proportions as understood in chemical reactions can not be strictly applied in this case. In all thoroughly investigated diseases a definite amount of antitoxin is required to fix or neutralize a given amount of toxin. A definite combination of toxin or antitoxin, however, does not take place readily, and for this reason variable quantities of each remain disassociated for some time.

Therapogen, W. FLATTEN (*Berlin. Tierärztl. Wchnschr., 1904, No. 38, pp. 637, 638*).—This is a new disinfectant which does not belong to the coal-tar series and therefore does not have the disagreeable odor of these products. Therapogen mixes readily with oils and does not injure metal instruments even when the latter are left in 20 per cent solutions for a period of 24 hours. It was shown by experiments to be strongly bactericidal for anthrax, glanders, typhoid, diphtheria bacilli, etc.

Test of plants supposed to be poisonous, W. H. HUTT (*Utah Sta. Rpt. 1903, pp. XXI, XXII*).—Samples were collected of wild hay which was said to be poisonous to cattle. An exam nation of hay showed that 3 plants were quite common in addition to grasses. These plants were *Smilacina stellata*, *Equisetum arvense*, and *Pastinaca sativa*. Samples of these weeds were obtained and fed to sheep without causing any poisonous effects to these animals.

The prevention of contagious pleuro-pneumonia, CONSTANT and MESNARD (*Rec. Méd. Vét., 81 (1904), No. 17, pp. 552–563*).—In previous experiments carried out by the authors, the fact was established that accidents following preventive inoculation for contagious pleuro-pneumonia usually depend upon the existence of a latent infection in the inoculated animals. The latent infection appears to cause, in conjunction with the inoculation, a localization of the virus. The duration of immunity produced by a single inoculation is at least 10½ months.

Further observations and experiments along this line are reported in the present paper. It was found that animals could be inoculated in the extremity of the tail with a small quantity of a virulent culture without producing serious consequences. Such inoculation, with doses of ⅛ cc. under proper antiseptic precautions, produces an immunity which exists for about 2 years. This method is recommended for practical application in the prevention of pleuro-pneumonia. In outbreaks of this disease the authors recommend the immediate destruction of infected animals and the inoculation of all exposed animals.

Some pulmonary lesions produced by the bacillus of hemorrhagic septicemia of carabaos, P. G. Woolley (*Philippine Dept. Int., Bureau Govt. Labs. [Pub.], 1903, No. 12, pp. 11*).—Hemorrhagic septicemia assumes a great variety of forms, some of which are described in this bulletin.

In one case in a carabao the symptoms were those of pleuro-pneumonia. Smears made from the blood, liver, lungs, and prescapular lymph glands showed considerable numbers of oval bacilli. In a second case, a post-mortem examination showed a subcutaneous edema on the sides. Cultures were made from abscesses on the lungs, and these organisms were pathogenic for monkeys, small birds, rabbits, and guinea pigs, whether inoculated subcutaneously, intravenously, or into the pleura and peritoneum. It does not appear to be clear how the bacillus of hemorrhagic septicemia gains entrance into the lungs.

Further experiments with parturient paresis (milk fever), C. B. Lane (*New Jersey Stas. Rpt. 1903, p. 380*).—Brief mention of the successful use of the Schmidt treatment in the case of one cow.

Comparative experiments on human and bovine tuberculosis, H. Preisz (*Ztschr. Tuberkulose u. Heilstättenw., 6 (1904), No. 3, pp. 221–230*).—Brief critical notes are given on literature relating to this subject. The author carried out a number of experiments in testing the effect of tubercle bacilli of human origin upon cattle. In one series of experiments 6 cattle were inoculated subcutaneously with human tubercle bacilli of mixed origin. In another set of experiments, 4 calves were inoculated intraperitoneally. In a third set of experiments 2 cows were inoculated intravenously, while in a fourth series 5 cattle were fed cultures from human tubercle bacilli.

Although 10 different races of human tubercle bacilli were used in these experiments, none was found which produced generalized tuberculosis of cattle. Among the 6 cattle which were inoculated subcutaneously the disease did not spread even to the neighboring lymphatic glands, except in one case. In a majority of cases large subcutaneous inoculations failed to produce even local alterations in the inoculated animals. Nevertheless, infection did occur in a few instances, and the author maintains, therefore, that considerable hesitancy should be felt in arguing in favor of a specific difference of these 2 forms of tubercle bacilli on account of the observed difference in virulence.

The transmissibility of human tubercle bacilli to animals, J. Karlinski (*Ztschr. Thiermed., 8 (1904), No. 6, pp. 401–416*).—The native cattle of Bosnia are known to be exceedingly resistant to the tubercle bacillus. Previous experiments of the author, however, had shown the possibility of infecting these cattle by means of human tubercle bacilli. In the present experiments native goats were selected as experimental animals.

Statistics from the inspection of meat of these animals showed that not a single case of tuberculosis had been discovered in 210,644 goat carcasses inspected. For the purpose of testing the resisting power of these goats 2 animals were inoculated intravenously with 5 cc. of an emulsion of human tubercle bacilli. The inoculation was performed in April, and in July both animals showed a pronounced reaction to tuberculin and considerable emaciation. The goats were killed and caseous foci were found in a majority of the mediastinal and tracheal lymphatic glands.

An extensive series of experiments was also carried out to determine the influence of inoculation with human tubercle bacilli upon pregnant goats. In these experiments 22 animals were used. Detailed notes are given on the results noted in each goat. It was found that the human tubercle bacilli were virulent in these experiments. The lymphatic apparatus was chiefly affected, while the lungs were more rarely attacked. The effect of inoculation was quite pronounced, as shown in the frequency with which abortion occurred. The transportation of the tubercle bacilli

into the milk was frequently observed in cases where no visible alteration of the udder was present.

The author also demonstrated by experiments that the virulence of human tubercle bacilli could be greatly increased by a single passage through goats. In another experiment one goat was inoculated intravenously with $\frac{1}{10}$ g. of a culture of avian tubercle bacilli. This goat was killed after a period of 5 months, at which time the tracheal glands were found to be enlarged, and caseous and tubercle bacilli were also found on the diaphragm and surface of the spleen.

Experiments with tuberculins made from human and bovine tubercle bacilli, S. B. Wolbach and H. C. Ernst (*Jour. Med. Research, 12 (1904), No. 3, pp. 295–311*).—The purpose of experiments reported in this article was to repeat the experiments of Koch with tuberculin on tuberculous guinea pigs, and to test the possibility of specific differences in tuberculins from human and bovine sources.

Cultures of tubercle bacilli were obtained directly from cases of the disease in man and cattle and were maintained on human and bovine blood. The virulence of the cultures were determined by the method of Theobald Smith, and the strength of the tuberculins by the method of Donitz. Guinea pigs were inoculated with this substance and subsequently treated with tuberculins. The detailed results of the experiments are reported in a tabular form. The local effect of tuberculin upon the abscess at the point of inoculation was the most marked action noted as a result of treatment with tuberculin. The abscess increased in size much more rapidly in the control animals, while in treated guinea pigs the abscess generally decreased in size and in a few cases healed. Autopsies made on the guinea pigs used in the experiments failed to show any differences in the character of the disease produced by human and bovine tubercle bacilli.

The authors conclude, therefore, that there is no specific difference between tuberculins from human and bovine sources, and that the tuberculin treatment acts somewhat favorably upon the development of tuberculosis in guinea pigs.

The channels of infection in tuberculosis in childhood, L. Kingsford (*Lancet [London], 1904, II, No. 13, pp. 889–892*).—The author presents an analysis of statistics relating to tuberculosis in children during the past 14 years. As a result of a study of these cases the author concludes that about 20 per cent were due to the ingestion of tuberculous material into the alimentary tract. It is stated that perhaps the danger from drinking tuberculous milk has been somewhat exaggerated, but the fact that 20 per cent of the cases of tuberculosis in children appear to arise from primary infection in the alimentary tract makes out a strong case against tuberculous milk.

Acclimatization to tuberculin, H. Vallée (*Ann. Inst. Pasteur, 18 (1904), No. 9, pp. 545–552*).—It has long been supposed that cattle may become nearly immune to the effects of tuberculin as a result of repeated injections. Numerous experiments along this line were carried out and reported by Nocard. The author instituted a series of experiments to test this acquired resisting power to the action of tuberculin.

It was found that, if the temperature be taken within 2 hours after the second injection of tuberculin and at intervals of 2 hours thereafter for 12 to 14 hours, the temperature curve may show a marked reaction. If, however, the temperature is first taken 12 hours after the injection the reaction may have entirely passed and the experimenter may thus fail to observe it. The author's experiments were carried out on 36 cattle, 32 of which could be definitely declared as tuberculous after the first tuberculin injection. The second tuberculin test was made 48 hours after the first, at which time 28 cattle gave a marked reaction and none of the others could be considered as free from tuberculosis. The temperature curves obtained by the author, however, show that the reaction to the second tuberculin inoculation is of very short duration as compared with that of the first.

On the basis of these experiments the author concludes that in a majority of cattle

there is never a true acclimatization to the effect of tuberculin, but that the reaction to a second tuberculin injection occurs so promptly and lasts so short a time that it is usually overlooked. In order to prevent any deception on the part of cattle vendors in making the tuberculin test, it is recommended that the inoculation be made about 5 or 6 o'clock a. m. and that approximately twice as large a dose be used as ordinarily, 8 cc. being considered a satisfactory dose for susceptible cattle. The temperature should then be taken at intervals of every 2 hours for a period of about 14 hours.

An experimental study on the effect of the blood sera of normal and immunized goats in modifying the progress of tuberculous infection, A. G. NICHOLLS (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 9 (1903-4), IV, pp. 3-32*).—The first observations relating to the agency of blood serum in checking the progress of tuberculosis were published by Héricourt and Richet in 1888, since which time a number of experiments have been made by other investigators along similar lines. The author studied the properties of normal and immunized goat serum as related to the progress of tuberculosis.

It was found that goats are relatively quite immune to tuberculosis and that the normal blood serum of goats contains a correspondingly large number of antitoxic units. In the first series of experiments several guinea pigs and rabbits were inoculated with mildly virulent tubercle bacilli and also treated with normal goat serum. Detailed notes are given on the history of each of these cases. It was found that tubercle bacilli were not disseminated to a distance from the site of the original inoculation with any of the treated animals. A second series of experiments were made on another lot of guinea pigs and rabbits, which were inoculated with a more virulent culture of tubercle bacilli. In these cases injection of normal goat serum had no effect in checking the disease in guinea pigs, but in rabbits such a result was noticeable.

Since the blood of healthy goats appears to be considerably antitoxic, the author attempted to intensify this property by inoculating healthy goats with gradually increasing doses of Koch's new tuberculin. Experiments were then carried out in testing the effect of the serum of such goats upon the progress of tuberculosis in rabbits.

As a general result of the author's studies it is concluded that the injection of antitoxic goat serum exercises a certain amount of restraining influence upon the extent and development of tuberculosis. This influence, however, is not enough to prevent entirely the extension of the disease. Normal goat serum injected into guinea pigs and rabbits is almost harmless and rarely produces any hemolysis. It appears to stimulate the nutritive processes and possess a slight antitoxic power against tuberculosis in rabbits. The natural antitoxic power of goat serum may be considerably increased by repeated injections with Koch's new tuberculin. The injection of this serum exercises no effect upon the temperature of the animal. A bibliography relating to serum treatment of tuberculosis is appended to the article.

The control of bovine tuberculosis (*Verslag. Meded. Afdeel. Landb., Dept. Waterst., Hand., Nijv., 1904, No. 3, pp. 30, pls. 2*).—In this pamphlet a general account is given of the present status of bovine tuberculosis in Holland, together with an account of the appearance of the disease in various organs and tissues. Notes are also presented on the losses from this disease, its distribution, and the means which have been adopted for controlling it in Denmark, Norway, Sweden, Belgium, France, and the Netherlands.

Texas fever in the Philippine Islands and the far east. The Australian tick (Boophilus australis) in the Philippine Islands, J. W. JOBLING, P. G. WOOLLEY, and C. S. BANKS (*Philippine Dept. Int., Bureau Govt. Labs. [Pub.], 1904, No. 14, pp. 21, pls. 24, figs. 4*).—In November, 1903, some cattle purchased in California north of the Texas fever quarantine line were landed in Manila and were

treated with immune serum for the purpose of protecting them against rinderpest. Twelve days after the second dose of ordinary prophylactic serum was given virulent blood was obtained and the so-called simultaneous inoculation was given to all except one of the cattle.

Among the cattle treated in this way, all except those which had just been imported from the United States gave reactions which were usually observed after inoculation with rinderpest blood. The results of treatment with the American cattle, however, were disastrous and a number of them died with the symptoms and pathological lesions of Texas fever.

The clinical history of all fatal cases was quite similar. These complications led to a study of the origin of the disease. It was found by inoculation tests that the native and Chinese cattle of the Philippine Islands were not susceptible to inoculation with blood containing the Texas fever organism, and that blood obtained from these cattle produced Texas fever in susceptible American cattle. It appears, therefore, that Texas fever is enzootic in the Philippine Islands and that the majority of the native and Chinese cattle are immune to the disease.

The tick which serves to carry the disease in the Philippines is *Boophilus australis*. Notes are given on the appearance, habits, life history, anatomy, and distribution of this tick. It passes at present under various names, such as the Australian, South American, Cuban, or Porto Rican tick, on account of its being found in all of these countries, and is specifically distinct from the Texas-fever tick of the United States.

Preliminary report on the study of rinderpest of cattle and carabaos in the Philippine Islands, J. W. JOBLING (*Philippine Dept. Int., Bureau Govt. Labs.* [*Pub.*], *1903, No. 4, pp. 22, pl. 1*).—A brief review is presented of the symptoms, means of transmission, pathological anatomy, and treatment of rinderpest. While most authors lay stress upon the frequency with which ulcers are to be found in the mouth in cases of this disease, this statement is found to be contrary to the experience which the author had in the Philippines. Clinical notes are given on a number of cases.

In controlling the disease the author recommends immediate isolation of all affected animals and the application of thorough disinfection. Exposed animals or other healthy animals may be immunized by one of several methods, which have already been described by different authors. These methods are briefly mentioned and attention is called to their chief advantages and disadvantages. The simultaneous method with serum and virulent cultures is perhaps best when it can be conveniently applied. In distant provinces, where it is impossible to obtain help or means of using this method, immunity may be produced by inoculation with defibrinated blood. Little effect can be produced by the use of any known method of treatment for rinderpest.

Veterinary notes. Diseases of sheep, T. W. CAVE (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 64–83, figs. 6*).—The author investigated an outbreak of a disease among sheep in which the sheepmen referred to affected sheep as "struck." The disease was found to be blackleg and the blackleg bacillus was found in every case which was investigated bacteriologically. Vaccination experiments were tried with satisfactory results.

It was found that the single vaccine as applied to 200 sheep was perfectly safe, but the duration of immunity thus produced was not determined. The double vaccine proved to be somewhat uncertain in its action and was slightly dangerous under certain circumstances. The danger from the use of vaccine is apparently considerable if vaccinated sheep are exposed to severe weather during the critical period.

A tapeworm disease due to *Moniezia expansa* in lambs was studied by the author and a successful method of control was elaborated. This consisted in accustoming the lambs to eat from troughs as soon as possible after birth. As soon as the lambs eat readily from the troughs a mixture containing linseed cake, pea meal, common

salt, aniseed, and sulphate of iron is added to the dry food already allowed. Apparently the lambs derived great benefit from dry feed combined with a tonic. A brief account is also presented of the flukeworm disease of sheep, with notes on the habits and life history of this worm and the usual methods of preventing infestation by it.

Report of sheep-dipping committee (*Jour. Bd. Agr. [London], 11 (1904), No. 6, pp. 358–364*).—A summary is presented of experiments in dipping sheep during which a large number of substances are employed as dips. The committee did not recommend any special dip as the result of their experiments, but it was found that the best dips of all classes are quite effective against both sheep scab and sheep ticks. It is recommended, however, that wherever a second dipping becomes necessary within 12 days, none of the arsenical or poisonous dips should be used. It was shown conclusively that one dipping with a good dip is enough to cure sheep scab. Carbolic dips as well as arsenical and sulphur dips are thoroughly effective in curing sheep scab, but the experiments showed that the use of the latter dips in too strong solution was attended with some danger to the sheep.

Diseases of swine, R. A. CRAIG and A. W. BITTING (*Indiana Sta. Bul. 100, pp. 71–204, figs. 23*).—This bulletin is in the nature of a brief handbook on the diseases of pigs. It is offered as a summary of investigations regarding the more important diseases which affect this animal.

Attention is called to the great importance of the swine industry and to the large losses which this business suffers through the prevalence of diseases. A general account is presented on the nature of diseases and the common means of spreading infection. Notes are also given on the methods of administering medicines to hogs. The diseases which are discussed in the main part of the bulletin are arranged according to the organs or parts most seriously affected. These diseases include all forms of digestive disturbances, including poisoning from various sources, diseases of the peritoneum, liver, urinary apparatus, generative organs, respiratory apparatus, heart, nervous system, udder, and skin.

Particular attention is given to an account of the infectious diseases of the pigs, especially hog cholera and swine plague. The internal and external parasites of pigs are also mentioned and notes are given on means of destroying them. At the close of the bulletin the authors present an account of immunity and vaccination with especial reference to hog diseases.

Swine erysipelas as the result of inoculation, MEYENBERG and WIETHÜCHTER (*Berlin. Tierärztl. Wchnschr., 1904, No. 38, pp. 638, 639*).—In the experiments of the authors in inoculating for the prevention of swine erysipelas, bad results have sometimes occurred in a high percentage of cases. Notes are given on the conditions under which these unfavorable results take place. In order to avoid such mishaps it is recommended that a veterinary serum institute be established open to membership to all of the veterinarians in the German Empire.

Pyemic cachexia and swine plague, OLT (*Deut. Tierärztl. Wchnschr., 12 (1904), Nos. 37, pp. 365–367; 38, pp. 377–380*).—As a result of the author's study of these diseases it is concluded that *Bacillus pyogenes suis*, discovered by Grips, is a specific, pyogenic organism which may cause local suppuration followed by spontaneous healing or chronic pyemia with fatal results. Pigs of all ages are susceptible to pyemic cachexia and young animals are most susceptible to artificial infection. The organism gains entrance to pigs chiefly through lesions due to operations or accidents.

The disease usually appears in an independent form, but may accompany other infectious diseases. It differs greatly in appearance according to the location of the pathological processes. The latter are observed most extensively in the lymphatic system of the abdomen, pericardium, and pleural cavities. The organism when carried through the blood system may cause suppurative inflammation of various joints and may produce metastases in the lungs. Grips' bacillus may even produce suppurative broncho-pneumonia but never swine plague. The latter disease is caused

by the bacillus of Löffler and Schütz. Notes are given on the differential diagnosis between swine plague and pyemic cachexia.

Hog cholera, R. G. MARCO (*Vet. Españ., Madrid, 47 (1904), No. 1689, pp. 406–408*).—Notes are given on the symptoms, lesions, distribution, and treatment of this disease, with an account of the different forms under which it occurs.

An outbreak of anthrax in horses, J. BOURGÈS (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 18, pp. 607–625*).—Brief notes are given on some of the more serious outbreaks of anthrax which have occurred in France in former years. The outbreak described in this paper occurred among a regiment of artillery horses numbering 510. After the first case appeared the disease spread rapidly. A number of sources of infection were suspected, among them being forage and water.

Notes are given on the progress of the disease in a number of cases and also on the symptoms and pathological lesions. Treatment appears to be effective only in chronic cases of comparatively mild type. The most successful means of preventing the disease consist in thorough cleansing and disinfection of premises and isolation or destruction of infected animals and proper sanitation for exposed animals.

The etiology of cerebro-spinal meningitis in horses, A. ZANGHERI (*Clin. Vet., 27 (1904), No. 37, pp. 217–221*).—As a result of the author's study and observations on this disease it is concluded that the cause of the disease is the diplococcus of Fränkel. The disease may appear in epizootic form and is apparently identical with the affection in man which is known under the same name.

Poisoning of horses from eating the plant Ornithogalum thyrsoides, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 25 (1904), No. 1, pp. 48–50*).—This plant was found to cause considerable losses among horses under natural conditions, and feeding experiments also demonstrated that the plant contained a violent poison. It produced acute gastro-enteritis and a very serious disturbance of the nervous system. No opportunity was had for attempting the curative treatment, but the author recommends the administration of a mixture consisting of a pint each of linseed oil and limewater.

Infectious catarrh of the upper respiratory passages, BÄCHSTÄDT (*Ztschr. Veterinärk., 16 (1904), No. 10, pp. 429–432*).—An outbreak of this disease occurred among the horses of one of the army regiments. The chief symptoms were a cough, depression, nasal discharge, and swelling of the laryngeal lymphatic glands. The diseased animal, as a rule, showed no elevation of temperature. The disease itself appeared to be undoubtedly infectious. Notes are given on the differential diagnosis between the disease and bronchial catarrh and contagious coryza. The best treatment consists in a suitably regulated diet, rest, and good ventilation. No satisfactory results were obtained by the use of drugs.

Preliminary report of the appearance in the Philippine Islands of a disease clinically resembling glanders, R. P. STRONG (*Philippine Dept. Int., Bureau Govt. Labs. [Pub.], 1902, No. 1, pp. 12, pls. 4*).—Attention is called to the fact that horses in the Philippine Islands are subject to a disease which may closely resemble glanders. The disease begins as a small nodule in the cutis, frequently near some slight abrasion, and extends gradually, in neglected cases, over various parts of the body, including the mucous membranes of the nose. Metastases may occur in the glands, but not so far as has been observed in the internal organs.

This disease is due to a species of blastomyces which does not grow readily on the ordinary nutrient media used in bacteriological study. The disease is distinct from bursattee, or beef farcy, and yields readily to proper treatment. This should consist in shaving the hair around the nodule when it first appears and cauterizing and thoroughly cleansing the nodule with corrosive sublimate, creolin, formalin, or benzoyl acetyl peroxid.

Practical and pathological horseshoeing, C. W. BRODHEAD (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 412–420*).—Special directions are given for preparing and

setting shoes for the purpose of correcting, so far as possible, certain defects, such as toe cracks, corns, navicular disease, overreaching, and founder.

Alexins antagonistic to the spirillum of septicemia of fowls, C. LEVADITI (*Ann. Inst. Pasteur, 18 (1904), No. 8, pp. 511-526*).—The author inoculated a number of rabbits under the peritoneum with blood containing numerous spirilla from a fowl killed on the third day of infection.

It was found as a result of these experiments that no alexins were developed in the organs or serum of inoculated rabbits at the end of the third day. On the seventh day, however, an extract of the spleen had the power of agglutinating spirilla, and the same was found to be true for extract of the omentum. It was found that between the fifth and seventh days the serum had the power of protecting fowls against the disease after inoculation, although the organs of such rabbits when examined and tested outside of the body showed no bactericidal power. The author believes that the omentum and spleen may be looked upon as special depots for the formation of alexins.

Further experiments along the same line indicate that extracts prepared from blood-forming organs (spleen, bone marrow, lymphatic ganglia) and the omentum show the development of the agglutinating substances inside of 4 or 5 days. The bactericidal power of extracts of these organs in vivo appears not to be developed until after 2 days. The spirilla penetrate into the organs chiefly concerned in the production of immunity by means of the circulatory system.

Notes on the so-called paralysis tick, Ixodes pilosus, C. W. MALLY (*Agr. Jour. Cape Good Hope, 25 (1904), No. 3, pp. 291-296*).—This tick is quite generally considered by farmers to be the cause of paralysis in sheep. A study was made of the distribution, habits, and life history of the tick. From his study of the general conditions surrounding outbreaks of so-called paralysis in sheep, the author concludes that the tick is not in itself the cause of the disease, and that there is no evidence to show that it may convey the disease. Paralysis is checked by proper dipping. One attack of the disease does not lead to complete immunity. Further experiments are necessary in working out the life history of the tick.

Trypanosomiasis of horses in the Philippine Islands, W. E. MUSGRAVE and N. E. WILLIAMSON (*Philippine Dept. Int., Bureau Govt. Labs. [Pub.], 1903, No. 3, pp. 28, pls. 2*).—In this report an account is given of the history of this disease in the Philippine Islands, the method of transmission and infection, symptoms, diagnosis, and means of prevention. Excessive losses have been suffered from this disease in the Philippines. The authors consider trypanosomiasis as one disease, including surra, nagana, tsetse-fly disease, mal de caderas, and dourine. The prevention of the spread of the disease to new centers may be brought about by the thorough application of quarantine laws and the application of proper sanitary methods to infected localities.

Trypanosomiases in French Sudan, L. CAZALBOU (*Rec. Méd. Vét., 81 (1904), No. 19, pp. 615-623*).—Along the Bani River, which is a tributary of the Niger, it has been found absolutely impossible to raise horses, cattle, sheep, goats, or asses. None of these animals are able to live for more than 1 year. An examination of this region showed that a number of flies belonging to the genera Glossina and Tabanus were present, and detailed notes are given on the form of trypanosomiasis in horses. An examination of the blood of affected horses showed that 2 species of trypanosoma were present, one of which appeared to be *T. brucei*, and the other, which was somewhat shorter, but thicker, was unknown. It appears to be a new species and is referred to under the name trypanosoma of baleri, the latter being the name of the disease as observed in French Sudan.

Report of a journey in the region of Kilwa to determine the occurrence and observe the habits of the tsetse fly, V. LOMMEL (*Ber. Land- u. Forstw. Deutsch-Ostafrika, 1 (1903), No. 4, pp. 341-350, fig. 1*).—Notes are given on the distri-

bution of this insect in the province of Kilwa as observed during the author's travels in that region. The tsetse fly appears not to prefer thick brush lands, but occurs in greater numbers in grass lands, especially in the vicinity of a forest. The fly is not particularly associated with a swampy region, but occurs most frequently on higher ground, at considerable distances from swamps. The insect is described in its various stages and notes are given on its life history.

According to the author's observations, there is no remedy which is likely to be effective in destroying this pest. The adult flies may be captured in considerable numbers, and this method of destruction would assist to some extent in controlling the insect. Attention should be devoted chiefly, however, to the prevention and treatment of tsetse-fly disease.

AGRICULTURAL ENGINEERING.

Proceedings of first conference of engineers of the reclamation service, with accompanying papers, F. H. NEWELL (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 93, pp. 361, fig. 1*).—This conference was held at Ogden, Utah, September 15–18, 1903, in connection with the Eleventh Irrigation Congress.

The bulletin contains, besides minutes of the meeting and a statement of the organization of the hydrographic branch of the U. S. Geological Survey, the address of the chief engineer of the reclamation service and the following papers: Western Hydrology, by N. H. Darton; Forestry and Irrigation, by G. Pinchot; Colonization, by F. de L. B. Tucker; Work of the Reclamation Service, by F. W. Mondell; Investigations in Arizona, by A. P. Davis; Salt River Valley Water Users Association, by B. A. Fowler; Reclamation Work in California, by G. C. Pardee; Work in Colorado, by A. L. Fellows; Topographic Work in the Grand Canyon of the Gunnison, by I. W. McConnell; The Colorado River, by J. B. Lippincott; Conditions in Idaho, by J. L. Morrison; Investigations in Idaho, by D. W. Ross; Limits of an Irrigation Project, by D. W. Ross; Investigations in Montana, by C. C. Babb; Construction in Nevada, by L. H. Taylor; Investigations in Pecos Valley, by W. M. Reed; Examinations in North Dakota, by C. H. Fitch; Irrigation in North Dakota by Pumping, by F. A. Wilder; Conditions in South Dakota, by C. H. Fitch; South Dakota Investigations, by R. F. Walter; Investigations in Oregon, by J. T. Whistler; Investigations in Utah, by G. L. Swendsen; Water Laws of Utah, by F. S. Richards; Work on North Platte River in Wyoming, by J. E. Field; Investigations in Wyoming, by J. Ahern; Work in Washington, by T. A. Noble; Relation of Federal and State Laws to Irrigation, by M. Bien; Electrical Transmission of Power for Pumping, by H. A. Storrs; Correct Design and Stability of High Masonry Dams, by G. Y. Wisner; Reconnaissance and Plans, by G. Y. Wisner, Reports and Statements, by H. N. Savage; Methods and Reports, by J. B. Lippincott; Irrigation Surveys and the Use of the Plane Table, by J. B. Lippincott; The Use of Alkaline Waters for Irrigation, by T. A. Means; Measurement of Flow of Streams, by E. C. Murphy; Instruments and Camp Equipment, by E. M. Douglas; Surveys in Oklahoma, by G. H. Matthes; Colorado River Reclamation Projects, by E. T. Perkins; Reclamation and Water Storage in Nebraska, by O. V. P. Stout; Portland-cement Manufacture, by E. C. Eckel; Legal Status of Irrigation, by H. L. Holgate; Power Development, by H. A. Storrs; The Reclamation Law, and Reclamation Surveys.

Irrigation in Northern Italy, I, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Bul. 144, pp. 100, pls. 18, figs. 14*).—This is an account of a study during the summer of 1902 of irrigation methods and practices in Lombardy and Piedmont which was undertaken in accordance with the law requiring this Office to report "upon the use of irrigation waters at home and abroad," and which had for its special object the obtaining of suggestions for the improvement of administrative, engineering, and agricultural practices in the United States.

The report is not a comprehensive treatment of Italian irrigation, but describes only those works and institutions which are thought to contain suggestions of value to American irrigators. The bulletin gives a general description of the Po Valley—water supply, climate, crops, irrigation laws and practice, irrigation works, etc.—and detailed accounts of irrigation under the Naviglio Grande, Villoresi, and Vettabbia canals in Lombardy; and of the water supply, state irrigation works, administration of irrigation works, settlement of water rights, duty and cost of water, structures for measurement and distribution of water, etc., in Piedmont.

This, which is the first part of the report, deals with studies of irrigation in Piedmont and Lombardy west of the canals from the Adda River. A second part will describe the irrigation and drainage works found between the Adda River and the Adriatic Sea, and a third will describe the administration of streams and some of the methods followed by the government in aiding the building of both irrigation and drainage works. A bibliography containing references to 100 of the more important works relating to Italian irrigation is included in the report.

Memoranda of plans of irrigation investigations (*Utah Sta. Circ. 2, pp. 23*).—The instruction and regulations for a series of irrigation investigations carried on in coöperation with this Department, together with memoranda of plans for the work in 1904, are presented. The instructions give in detail the data to be collected, the method of measuring and applying water, and the manner of taking crop and soil samples.

Accuracy of stream measurements, E. C. MURPHY (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 95, pp. 169, pls. 6, figs. 59*).—"This paper is a revision and enlargement of paper No. 64 [E. S. R., 14, p. 404]. It embodies the results of an extension of the investigations, in the hydraulic laboratory of Cornell University, of the flow of small and moderate sized streams."

Irrigation and land drainage, W. G. COX (*Agr. Gaz. New South Wales, 15 (1904), No. 8, pp. 723–732, fig. 1*).—This is a discussion of the importance of irrigation in New South Wales and of the necessity for drainage in connection with irrigation, as well as of methods and cost of draining swamp lands.

The use of alkaline and saline waters for irrigation, T. H. MEANS (*Forestry and Irrig., 10 (1904), No. 8, pp. 350–354*).—A general discussion of the subject.

Hydrographic manual of the United States Geological Survey, E. MURPHY, J. C. HOYT, and G. B. HOLLISTER (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 94, pp. 76, pls. 3, figs. 10*).—This bulletin "gives instructions for field and office work relating to gauging of streams by the use of current meters."

Tilling the "tules" of California, A. J. WELLS (*Amer. Mo. Rev. of Reviews, 30 (1904), No. 176, pp. 312–317, figs. 12*).—A general account of the reclamation and culture of the tule lands in the vicinity of the junction of the Sacramento and San Joaquin rivers in California.

How the Dutch have taken Holland, F. D. HILL (*Amer. Mo. Rev. of Reviews, 30 (1904), No. 176, pp. 318–322, figs. 4*).—A general account of the reclamation of land from the sea in Holland and of the proposed drainage of the Zuyder Zee.

Irrigation on the Lower Durance, G. CARLE (*Jour. Agr. Prat., n. ser., 8 (1904), No. 39, pp. 402–406*).—The system followed in this region is briefly described.

Historic highways of America, A. B. HULBERT (*Cleveland, Ohio: Arthur H. Clark Co., 1904, vols. 13, pp. 231, pls. 5, maps 2; 14, pp. 234, pls. 3, maps 2*).—These two volumes deal with the great American canals, the first with the Chesapeake and Ohio Canal and the Pennsylvania Canal and the second with the Erie Canal. (For notes on previous volumes see E. S. R., 16, p. 306.)

MISCELLANEOUS.

Report of work at McNeill Branch Station for 1903, E. B. FERRIS (*Mississippi Sta. Bul. 83, pp. 34*).—A general statement is made regarding the work, stock, and equipment of the branch station. Physical and chemical analyses of the soil at the station are given, as well as analyses of 9 commercial fertilizers used in comparative field tests. The results of experiments with a number of field, garden, and orchard crops, and of feeding experiments with steers are noted elsewhere in this number. The bulletin also contains a summary of the temperature and precipitation during each month of the year.

Fourteenth Annual Report of Utah Station, 1903 (*Utah Sta. Rpt. 1903, pp. XLII*).—An outline is given of the work of the various departments of the station during the year, with a financial statement for the fiscal year ended June 30, 1903, and an index to the annual report and the bulletins published during the year 1902–3. An account of cooperative experiments carried on with this Department for the control of sugar-beet disease is noted elsewhere in this number, as is also an account of some plants supposed to be poisonous to stock, and of work in the control of insects.

Yields of the principal cereals in 1903 (*Stat. Jahrb. K. K. Ackerbau Min., 1903, No. 1, pp. 41–54*).—Statistics on the production of wheat, rye, barley, oats, and corn in Austria for the season of 1903 are given.

Mixed farming at Wagga Experimental Farm, W. H. CLARKE (*Agr. Gaz. New South Wales, 15 (1904), No. 4, pp. 301–312, figs. 9*).—Data are given regarding the feeding of sheep, turkeys, and pigs, raising of horses for farm requirements, and the ensiling of natural grasses, herbage, and cultivated crops.

Memoranda of plans for arid farm investigations (*Utah Sta. Circ. 1, pp. 63, dgms. 6*).—This circular contains the plans for proposed experiments to determine the possibility of growing crops without irrigation. Appropriations for this purpose were made by the State, and the work was placed under the direction of the experiment station. Six farms have been selected in different parts of the State and the work to be done on each one is outlined and indicated upon a plan. General instructions to the foremen and employees of the farm are also given.

Farmer's cyclopedia of agriculture, E. V. WILCOX and C. B. SMITH (*New York: Orange Judd Co., 1904, pp. XXIV + 619, figs. 477*).—A handbook of agriculture, horticulture, animal husbandry, dairying, and the like, written in popular style, and intended as a reference book for farmers and others interested in agricultural practice.

The volume is divided into eight parts, treating respectively of field crops, garden crops, fruits and nuts, cattle and dairying, other live stock, poultry, fertilizers, soils, drainage and irrigation, and miscellaneous matters. The articles under each section are arranged alphabetically on the plan of an encyclopedia, and are short and concise in treatment. While the style is popular, free use has been made of the work of the experiment stations and this Department, and the results have been drawn upon largely in discussing improved methods of agricultural practice. Indeed, the book may be regarded to quite a large extent as a concise summary of the more recent literature of agriculture published by the various agencies for agricultural experiment and investigation in this country.

The scope of the work is quite broad, including the treatment of plant and animal diseases, the methods of combating injurious insects, various classes of agricultural organizations and institutions, agricultural industries of minor importance, periodical and other literature relating to agriculture, and other matters of general interest, as well as questions relating to agricultural management. The large number of illustrations add materially to the value and interest of the volume, and the detailed indexes, arranged under both scientific and common names, enable ready reference to any of the topics treated.

NOTES.

Alabama College Station.—C. F. Kinman has been appointed assistant horticulturist of the station, vice T. B. Rivett, resigned.

California Station.—R. E. Mansell has been appointed head gardener of the central station at Berkeley, in place of Emil Kellner, deceased. The board of regents has appropriated $7,000 for the erection of a temporary building for the entomological division near the present station building, in order to relieve the crowded condition arising from new activities.

Colorado College and Station.—At a recent meeting of the board of trustees it was decided to regard all work in agricultural experimentation at the college as experiment station work, to be carried on under the direction of the station, and to make the appropriations for this work directly to the experiment station. Provisions were made for entering into a contract with this Department in horse breeding experiments. The college this year inaugurated a short course in practical agriculture for mature stockmen and farmers, which began January 16 and continued for two weeks. Special attention was given to the judging of different classes of live stock, and also to their common diseases, feeding, breeding, and management. Good representatives of the various breeds of live stock and of types of the market classes were secured for demonstration, and leading feeders and breeders of the various classes of live stock assisted in the lectures and demonstrations.

Connecticut Storrs Station.—Theodore Issajeff has been appointed cheese maker in the cooperative work between the station and the Dairy Division of this Department.

Louisiana University and Stations.—W. C. Stubbs, who has been since 1885 professor of agriculture in the State University and director of the experiment stations, has voluntarily retired. He is succeeded by Prof. W. R. Dodson, who becomes, by virtue of his office as professor of agriculture at the university, director of the three stations in the State, director of the State geological survey, official chemist, etc.

Massachusetts College.—At the annual meeting of the board of trustees, held early in January, attention was called to the overcrowded condition of the college, which has made it impossible this year to give the instruction called for in the courses to all of the students. To meet this contingency and to provide facilities which the college has long needed it was decided to ask the State legislature for a total appropriation of $106,650, mainly for buildings. This amount includes $40,000 for a horticultural building and equipment, $14,600 for a greenhouse for demonstration work in market gardening, floriculture, etc., and $35,900 for an addition to the botanical building of the experiment station, to be used for instruction purposes, together with equipment for the same. An appropriation of $5,000 is to be asked for improved live stock, and a similar amount for enlarging the electric-light plant. President H. H. Goodell was granted six months' leave of absence, owing to the condition of his health.

Nevada Station.—Oscar J. Smith, of Reno, and Henry S. Starrett, of Battle Mountain, have been elected to the board of control. Mr. Starrett formerly served on the board for a period of six years. The station has recently added to its live stock by the purchase of 2 pure-bred Holstein cows, a pure-bred Holstein bull, 4 grade

Holstein cows and heifers, 30 grade Merino sheep, a pure-bred Berkshire sow, and a pure-bred Duroc Jersey sow.

New York State Station.—S. A. Beach has been elected professor of horticulture in the Iowa College, and horticulturist to the experiment station, and will enter upon his duties next September.

North Carolina Station.—The North Carolina State board of agriculture at its recent meeting established an experiment farm near Hendersonville, in the mountain section of the State, where experiments will be conducted with orchard fruits and trucking crops which are or can be grown to advantage in the mountain section of the State. Work will be begun on this farm early in January.

The location of another farm in the eastern trucking section of the State was authorized for the purpose of conducting experiments with truck crops, the growing of which has become a large and important industry in the eastern section of the State. A site has not yet been selected, but it is hoped to obtain it in time to begin work in the spring. The department already has in operation two farms of the kind referred to above, one being located on a good type of red-clay land in the Piedmont section and the other in the northeastern coastal plain section. Both of these farms are given up to experiments with general farm crops. They have been in operation two and four years, respectively, and have proved quite satisfactory for the purpose for which they were used.

Ohio Station.—F. A. Derthick has resigned his membership in the board of control in order to accept a similar position in the board of trustees of the State University, and T. C. Laylin, of Norwalk, has been appointed in his place.

Oklahoma College and Station.—C. H. Tourgee, B. S. A., a graduate of the Iowa State College, has been appointed assistant in dairying in the college and assistant in agriculture in the station, vice J. B. Griffing, resigned.

Pennsylvania Station.—The last number of *Landwirtschaftliche Jahrbücher*, the official organ of the Prussian ministry of agriculture, contains a translation in full of the report upon the first year's experiments with the respiration calorimeter at the Pennsylvania Station, which recently appeared as Bulletin 51 of the Bureau of Animal Industry. J. P. Gray has been appointed by the United States Secretary of Agriculture as assistant expert in animal nutrition for four months beginning December 20, and assigned for duty in connection with the investigations to be carried on with the respiration calorimeter.

Tennessee Station.—H. A. Morgan, professor of zoology and entomology in the Louisiana State University and entomologist of the experiment station, has been chosen director of the Tennessee Station.

West Virginia Station.—Frank H. Grout has been appointed assistant chemist and will devote his time largely to work for the State geological survey under the direction of the station chemist.

Wyoming College and Station.—When the Wyoming State constitution was adopted in 1890 the several State institutions were temporarily located for a period of ten years. The last State legislature provided that the question of permanent location of State institutions should be submitted to popular vote, and by the recent election the State University has been permanently located at Laramie. The question of separating the agricultural college and experiment station from the university will again come before the legislature this winter, and it is hoped that final disposition of the matter may be made. Because of the high altitude of the experiment station at Laramie, which makes its conditions different from those of any other station, there is a strong sentiment in favor of its present location.

Referees of Official Agricultural Chemists.—The referees appointed for the coming year are announced as follows: *Phosphoric acid*, E. W. Magruder, Richmond, Va.; *nitrogen determination*, F. A. Urner, Geneva, N. Y.; *separation of nitrogenous bodies*, R. Harcourt, Guelph, Canada (milk and cheese proteids); *potash*, G. S. Fraps, Col-

lege Station, Tex.; *soils*, C. G. Hopkins, Urbana, Ill.; *dairy products*, G. E. Patrick, Washington, D. C.; *foods and feeding stuffs*, J. O. La Bach, Lexington, Ky.; *food adulteration*, W. D. Bigelow, Washington, D. C.; *sugar*, L. S. Munson, Washington, D. C.; *tannin*, H. C. Reed, Stamford, Conn.; *insecticides*, B. H. Smith, Washington, D. C.; *inorganic plant constitutents*, R. W. Thatcher, Pullman, Wash.; *medicinal plants and drugs*, L. F. Kebler, Washington, D. C.

Following are the associate referees: *Phosphoric acid*, J. A. Bizzell, Ithaca, N. Y.; *nitrogen determination*, J. H. Gibboney, Blacksburg, Va.; *separation of nitrogenous bodies*—meat proteids, W. D. Bigelow, Washington, D. C., and vegetable proteids, J. S. Chamberlain, Washington, D. C.; *potash*, A. L. Knisely, Corvallis, Oreg.; *soils*, R. H. Loughridge, Berkeley, Cal.; *dairy products*, F. W. Woll, Madison, Wis.; *foods and feeding stuffs*, J. K. Haywood, Washington, D. C.; *food adulteration*—colors, W. G. Berry, Appraiser's Office, New York, N. Y.; saccharine products (including confectionery), J. Hortvet, St. Paul, Minn.; fruit products, J. S. Burd, Moscow, Idaho; wine, G. E. Colby, Berkeley, Cal.; beer, H. E. Barnard, Concord, N. H.; distilled liquors, C. A. Crampton, Washington, D. C.; vinegar, Richard Fischer, Madison, Wis.; flavoring extracts, E. M. Chace, Washington, D. C.; spices, A. L. Winton, New Haven, Conn.; baking powder and baking chemicals, R. O. Brooks, Trenton, N. J.; meat and fish, M. E. Jaffa, Berkeley, Cal.; fats and oils, L. M. Tolman, Washington, D. C.; dairy products, A. E. Leach, Boston, Mass.; cereal products, A. McGill, Ottawa, Canada; infants and invalids' foods, H. W. Wiley, Washington, D. C.; vegetables, W. N. Berkeley, San Juan, P. R.; condiments other than spices, J. D. Hird, Washington, D. C.; cocoa and cocoa products, E. N. Eaton, Chicago, Ill.; tea and coffee, H. C. Lythgoe, Boston, Mass.; and preservatives, W. D. Bigelow, Washington, D. C.; *sugar*—molasses methods, H. E. Sawyer, Boston, Mass.; special analytical methods, C. A. Browne, jr., Audubon Park, New Orleans, La.; *tannin*, F. P. Veitch, Washington, D. C.; *insecticides*, S. Avery, Lincoln, Nebr.; *inorganic plant constituents*, F. T. Shutt, Ottawa, Canada.

International Live Stock Exposition, 1904.—The International Live Stock Exposition was held in Chicago November 26 to December 3, and in all essential features was even more successful than earlier expositions. The exhibits of fat stock, breeding cattle, sheep, swine, and horses were very fine. Owing to the danger to breeding classes of swine from hog cholera, the exhibit this year was confined to fat barrows, which could be marketed at the close of the show, an innovation which seems to have been regarded with much favor by exhibitors. As is generally the case, the agricultural colleges and experiment stations were well represented in the list of judges, officials, exhibitors, and in other ways.

Prof. C. F. Curtiss, of the Iowa Station, one of the directors and a member of the executive committee of the association having the management of the show, was one of the judges, as were also Profs. W. L. Carlyle, J. A. Craig, W. A. Henry, G. C. Humphrey, and W. J. Rutherford, while Drs. G. H. Glover and A. T. Peters were on the veterinary board.

The numerous entries of the colleges and stations resulted in a large number of prizes. In the college competitions special prizes were offered for stock from the agricultural colleges and experiment stations, and there were entries from the Iowa Agricultural College and Station, Minnesota Experiment Station, Purdue University, University of Nebraska, and University of Wisconsin. The Minnesota Station won first prize for 2-year-old steers, Purdue University second, the University of Nebraska third, and the Iowa Agricultural College fourth. For yearlings, the Iowa Agricultural College won first and third prizes, the University of Nebraska second, and Purdue University fourth. For the calves, Iowa Agricultural College won first and third, Purdue University second, and the University of Minnesota fourth prize. Clear Lake Jute No. 2, of the University of Minnesota, was champion, while the Iowa College was given first place for a herd of 3.

In the college sheep classes the University of Wisconsin won first, second, and third prizes for pure-breds, grades, and crossbred wethers a year old and under 2 years. It also took first, second, and third prizes for wether lambs, and a special prize for the best 5 wethers under 2 years old, and showed the champion wether.

In the college swine show the Iowa Agricultural College won first and third prizes, and the Minnesota Experiment Station second, for barrows under 12 months old, while the former institution also received a prize for the best 5 barrows under 2 years old, and the barrow championship.

The colleges and stations also won a number of prizes in the classes open to all competitors. In the fat-stock class the grand championship was for the third consecutive year awarded to a college or station exhibitor, the University of Minnesota winning with the 2-year-old Aberdeen-Angus steer, Clear Lake Jute No. 2, which was last year reserve champion, and was champion over all breeds as a calf. As noted above, he was also champion in the college exhibit. He was bought at auction by the Minnesota Station for about $600, and was fattened at the station, the ration consisting of grain with roots and coarse fodder and pasturage during a part of the time. His weight on December 1, 1903, was 1,620 lbs., and on October 11, 1904, it was 1,790 lbs.

Of the prizes for steers of different breeds and ages, the Iowa College won a first and a fifth prize for Shorthorns, a first for Herefords, and a third for Galloways. The Minnesota Station won a fifth prize for Herefords and Purdue University a fourth for the same breed. In the grades and crosses class, the first prize for 2-year-olds was awarded to the Indiana Station, second to the Nebraska Station, and fifth to the Iowa College. In the senior yearlings class the Nebraska Station won fifth prize. In junior yearlings, the first and second prizes were awarded to the Iowa College. In the junior calf class, the Iowa Station received first and the Minnesota Station second prize.

In the dressed-carcass lots, the second, third, and fourth prizes for 2-year-olds were awarded to the Minnesota Experiment Station and the first prize for yearlings to the Iowa Agricultural College.

For pure-bred fat sheep, the University of Wisconsin received a second prize for Shropshires; a second, third, and fifth for Southdowns; a second for Hampshires, and 2 firsts and 1 second for Cheviots, as well as the championship for a wether of this breed. In the grades and crosses class the same institution received 2 first prizes, 4 seconds, 2 fourths, and 2 fifths, as well as a first prize and the grand championship for a pen of 5 wethers. In this class the Minnesota Station received 2 fourth prizes. The Iowa College received a prize for a carload lot of native wethers 1 to 2 years old.

In the display of fat barrows, the Iowa Station took first, second, and third prizes on Berkshires, as well as all the prizes for which it competed in the Chester White class, and prizes for large Yorkshires, of which it was the only exhibitor. This station was also awarded a grand championship in the Berkshire class of barrows of 300 lbs. or over. This hog was later made grand champion of all breeds, and was shipped back to the Iowa College to serve as a model in class work. The Minnesota Station won a third prize in the Berkshire class, as well as prizes for Tamworths, in which class it was the only exhibitor. The Iowa Station won three second and the Minnesota Station a third prize for pens of 5 barrows in the Berkshire classes. The Iowa College won first and third prizes for dressed carcasses weighing 300 lbs. or over and a second prize for carcasses weighing 200 to 300 lbs.

The University of Illinois did not enter live stock for prizes, but showed a special exhibit of market classes of cattle, which was a collection of carefully chosen animals illustrating all the classes of cattle definitely recognized in the current market quotations. Above each animal was a placard showing its class and giving a description of the type. This exhibit excited much interest.

Large numbers of students from the agricultural colleges were present, and a meeting of the American Federation of Agricultural Students was held on the evening of November 29.

The student stock-judging contest, the fifth annual competition, took place on November 26, and was participated in by the Iowa, Kansas, Michigan, Ontario, and Texas agricultural colleges and by the universities of Minnesota and Ohio. This year the contest was divided into 2 sections, one for cattle, sheep, and hogs, and the other for horses. The Ohio students won the Spoor trophy for the best work in judging cattle, sheep, and swine, the Texas team ranking second. The Spoor trophy for horse judging fell to the Iowa College, the Ontario team ranking next. Cash prizes aggregating $500, offered by one of the Chicago commission firms, were awarded to individual members of the competing teams making the highest score of points, W. A. Martin, of Ohio, receiving first prize and W. C. McKillican, of Ontario, second.

On November 28 a corn-judging contest was held for a fine bronze trophy, offered by A. E. Cook, of Iowa, which was open to all college students. The only institutions participating were the Iowa and Kansas colleges, first place being awarded to the Kansas team. The competitors were given 5 samples of corn each, made up of 10 ears, 3 samples to be judged as pure-bred types and 2 as corn best suited for farmers' needs regardless of types. The competitors were required to select the first, second, and third best ears and give reasons for the selections made.

The annual meeting of the International Live Stock Association was held in the Assembly Hall of the Pedigree Record Building on Monday, November 28, and was largely attended. An address was delivered by Dr. A. B. Storms, president of the Iowa Agricultural College, on the Economics of Modern Industry, special stress being laid on the live-stock exhibit as a factor in education.

The enthusiasm manifested at the meeting and the sums of money pledged indicate that the much-needed colosseum will be built, so that the international live-stock shows may be held in the future under much better surroundings than at present.

Prof. J. L. Budd.—Prof. Joseph L. Budd, of Iowa, who died at Phoenix, Ariz., November 20, was a pioneer in horticultural instruction. He was one of the very first to occupy a chair in that subject after it was given a separate place in the agricultural curriculum, and for 23 years he remained at the head of the horticultural department of the Iowa Agricultural College, retiring in 1898 as professor emeritus.

Previously a successful nurseryman, whose writings had given him wide reputation, he brought to his college position a clear insight into the possibilities of western horticulture, which enabled him to become a leader in establishing fruit growing in a country where the early indications foreshadowed failure. The varieties and methods which had succeeded in the East were found valueless in that country subject to periods of drought in summer and extreme cold in winter. The whole system of fruit growing had to be revolutionized.

Professor Budd was among the first to advocate the value of Russian fruits for the West, and was instrumental in securing the importation of many scions of these fruits between 1875 and 1880. In 1882 he made an extended visit to Russia and Northern Europe, securing for importation numerous varieties of apples, pears, plums, forest trees, ornamental shrubs, etc., which eventually were widely introduced throughout the State and in the Northwest. These importations have infused an element of hardiness into the fruits of that section, and considerably extended the limits of successful fruit culture, besides adding greatly to the arboriculture of the region.

Professor Budd was for 18 years secretary of the Iowa State Horticultural Society, whose reports contained many of his writings; and was joint author with his former pupil, Prof. N. E. Hansen, of the American Horticultural Manual, a comprehensive two-volume work published in 1902–3. He had been in failing health for several years past, and had spent his winters South. His death was due to a general breakdown, from which at his age (nearly 70) he was unable to rally.

Death of Director Wilfarth.—Hermann Wilfarth, director of the agricultural experiment station at Bernburg, Germany, died November 27, 1904. He was for many years assistant to Prof. H. Hellriegel at the Bernburg Station, and was associated with him in the classic investigations on the nitrogen feeding of Gramineæ and Leguminosæ, published in November, 1888, in which the assimilation of the free nitrogen of the air by leguminous plants in symbiosis with root tubercle bacteria was first clearly demonstrated and explained. He was also associated with Hellriegel in the development of his system of sand-culture experiments, and had charge of many of the details of the experiments. Upon the death of Hellriegel, in 1895, he succeeded him as director of the station, and has continued the study of the fertilizer requirements of plants in pot cultures. He was born in Hamburg May 21, 1853.

Prof. Selim Lemström.—The issue of *Nature* for December 8 contains an obituary note upon Prof. Karl Selim Lemström, of Finland, the widely known physicist and meteorologist, whose death occurred October 2. Professor Lemström's name is a familiar one to the readers of this journal, where his work of agricultural interest has been frequently noted. He made an interesting study of night frosts and the means of preventing their devastations by artificial clouds of smoke, for the production of which he devised torches or tubes of peat. His work on this subject was extended by other investigators to several countries. He also made important experiments on the influence of electricity on plant growth, and several of his papers upon that subject have been abstracted in the Record.

Miscellaneous.—A note in *Nature* states that in the sale of Chartley Park, Staffordshire, the remnant of the celebrated herd of white cattle which have been kept on this estate for the last 700 years, did not go with the park, and will consequently come under a separate ownership. Much regret is expressed at this, and it is hoped that they will be given a safe home by their new owner where they will flourish and increase. The herd is believed to be reduced to 9 head, and it is pointed out that the capture of these by the new owner will be no easy task. In commenting upon the herds of wild cattle in various British parks, it is stated that these were long considered to be direct descendants of the wild aurochs, but "it is now generally admitted (largely owing to the writings of Mr. Lydekker) that they are derived from domesticated albino breeds nearly allied to the Pembroke and other black Welsh strains, some of which show a marked tendency to albinism. This view, as pointed out by a writer in the *Times* of November 29, is strongly supported by the fact that the Chartley cattle frequently produce black calves. The theory advocated by a later writer in the same journal that the British park cattle are the descendants of a white sacrificial breed introduced by the Romans rests upon no solid basis."

A yearbook of plant diseases has been established in Russia under the Imperial Botanical Garden. This is based largely on the correspondence which comes to the garden, and the reports of a large number of voluntary observers who send in samples of the diseased material and information concerning the distribution of the disease. The yearbook for 1903, which has been issued, contains descriptions of these diseases, the extent of their ravages, and means of combating them. The work is directly under the charge of the Central Phytopathological Station.

Prof. Willet M. Hays, of the Minnesota College and Station, entered upon his duties as Assistant Secretary of this Department with the beginning of the new year. He has been granted leave of absence by the Minnesota institution.

E. H. Webster, a graduate of the Kansas Agricultural College, and for a time an assistant in dairying in that institution, has been appointed chief of the Dairy Division in this Department. Mr. Webster was formerly connected with the Division as dairy inspector.

Dr. F. Nobbe, professor of botany and plant physiology in the Forest Academy at Tharand, Germany, has retired.

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EXPERIMENT STATION RECORD.

Vol. XVI. February, 1905. No. 6.

The statistics relating to the students in agriculture at the agricultural colleges of this country permit of some interesting deductions as to the attendance and the teaching force. These statistics have just been compiled by this Office from returns made by the colleges to the Bureau of Education.

Forty-four institutions report a total enrollment of 2,904 students in agriculture and horticulture. This number includes only those taking these subjects in the collegiate course. It does not include the short-course students, who numbered last year over six thousand, or the students in agriculture in the preparatory or high school courses. Michigan reports 148 agricultural students, Illinois 160, Massachusetts 181, Kansas 198, Missouri 200, South Carolina 232, Mississippi 272, and Iowa 357. Twenty-eight colleges report less than fifty students in these subjects, twenty less than twenty-five students, and eleven colleges ten students or under.

The method of classifying the students at various institutions does not make the figures entirely comparable, the requirement at several colleges that all students take agriculture during the first year or two making the apparent number of students in that course relatively large. The grade of instruction at the different institutions also varies considerably. However, these figures are the best obtainable under the circumstances, and are taken as reported by the various institutions.

The numbers of instructors in agriculture and horticulture in the different colleges show, as might be expected, very wide variation. This enumeration has been confined merely to the instructors in the teaching departments of agriculture and horticulture (not the college of agriculture), and includes the teachers in such branches as agronomy, animal industry, dairying, soils, and forestry. Instructors in agricultual chemistry, agricultural botany, and other sciences related to agriculture are not included in this statement, nor are the emeritus professors, the idea being to get at the provision made in the various institutions for the teaching of the agricultural and horticultural branches themselves.

This summary shows that there are at present 268 instructors who may be credited to those departments, an average of 5.7 officers to an institution. But in thirty-one colleges the number is below this average, and in only sixteen is it equal to or above it. As a matter of fact, the average would be materially lower were it not for some six or eight institutions which have a sufficiently large number of instructors to place them in a class by themselves. Several colleges have only a single instructor for these subjects, and often he has teaching work in other branches or duties in the experiment station. More than half of the colleges have from three to five men in these two departments, while eight institutions have from eight to twelve men. Cornell University lists fifteen instructors in these departments, Iowa twenty, and Illinois twenty-one, while Wisconsin heads the list with twenty-three, although several of this number are obviously employed for the short-course work.

These numbers include not only the professors in the branches of agriculture and horticulture, but the assistants and instructors as well. Considering the number of men which the leading colleges now regard as necessary to represent the more general divisions of the subject, it will be seen that a relatively small number of colleges have what can be regarded as a strong agricultural faculty, or have made great progress in diversifying the subject in the direction of providing assistant professors or instructors in its various branches.

A study of the relation between the teaching force in agriculture and horticulture and the number of students in these subjects brings out some interesting points, both in relation to the different agricultural colleges and to other departments of these and similar institutions.

Excluding three colleges for which the returns are incomplete, the general average the country over is a little over ten students to an instructor in agriculture and horticulture. But the variation is very wide. At several institutions there are only two or three students for each instructor in those subjects, while in Illinois there are eight, in Michigan thirteen, in Iowa eighteen, in Oregon and Texas twenty, in Missouri twenty-two, in Massachusetts thirty-six, in South Carolina forty-six, and in Mississippi sixty-eight agricultural students for each instructor. At eighteen colleges there are ten or more students to each instructor in these branches.

Taking all departments of the colleges of agriculture and mechanic arts, and considering all courses except the short and preparatory courses, there is an average of almost exactly ten students to each officer of the college, or the same number as given above for the departments of agriculture and horticulture. The proportion at the Massachusetts Institute of Technology, which embraces the mechanic

arts without the agriculture, is eight students to each instructor, taking the whole institution.

An article in a recent issue of *Science* gives returns for twenty-one of the leading American universities showing the number of students and instructors, and the relative proportion between them in each case. The range of the latter is from one instructor to 4.74 students (Johns Hopkins) to 1:17.45 (Missouri University) and 1:18.63 (Minnesota University). The average for the twenty-one institutions is one instructor to ten students, which, curiously enough, agrees with the relation of students to instructors in agriculture and horticulture.

Several of the universities mentioned have colleges of agriculture connected with them, and in every such case but one the relation of students to instructors is larger in the university than in agriculture and horticulture. Missouri is the exception, with 17.45 students to each instructor for the whole university, and twenty-two to one in agriculture and horticulture. For the University of Illinois the proportion is one instructor to 8.85 students, and in agriculture and horticulture one to eight.

The above relationships are given as illustrating conditions which exist, and not as a statement of the needs of the instruction force in agriculture. The number of students to be taught at any given time is not regarded as the proper basis for determining the strength of the teaching force, if the subject of agriculture is to be properly developed in the institution; but it has so frequently been the basis of contention on the part of college officers that it is interesting to see how it has actually worked out.

The average derived above of one instructor to ten students, representing as it does all departments of the twenty-one universities cited and the colleges of agriculture and mechanic arts as a whole, may fairly be applied to any single department or group of departments. Hence it may be used, as it was above, as a basis of comparison in the case of the departments of agriculture and horticulture, considering these two together; for surely no one will contend that a smaller instruction force in proportion to the students to be taught is needed in those departments than in others where less laboratory and practicum work are involved.

At eighteen agricultural colleges the number of instructors in agriculture and horticulture is less than one instructor to ten students, i. e., the instruction force is below the above average. In fifteen of these cases there are five or less instructors in the departments of agriculture and horticulture, the average for these fifteen being 3.8 instructors. In all of these institutions several of the instructors are also carrying important departments in the experiment station, the directorship often being included. Evidently in these cases insuffi-

cient provision has been made for teaching the subject, in comparison with other departments, although there has been demand for agricultural instruction. Here the contention does not hold that the teaching force is small because of a small demand.

At eighteen institutions, on the other hand, there are only five or less students to each instructor in agriculture and horticulture. This apparently favorable condition is not always an indication that the subject has been developed, for in nine cases this proportion is found to be accompanied by both a small teaching force and a small number of students (ten or less). In other words, there has been little provision and little resulting demand. In one or two cases the disproportion may be ascribed to a considerable increase in the teaching force during the past year or two, from which there has hardly been time to realize a proportionate increase in attendance.

While, therefore, there are difficulties in making comparisons of this sort, it appears evident that a considerable number of institutions located in agricultural communities have not yet made adequate provision in the teaching force for agriculture and horticulture. On the one hand the number of students to the teaching force is disproportionately large at many institutions, due to the fact that the teaching force has not developed in proportion to the demands for instruction. On the other hand there are a considerable number of institutions where the teaching force has remained very low and the attendance likewise.

If these figures suggest anything, they suggest, as Dean Davenport said at the Des Moines meeting, that the number of students to be taught at a given time is not the proper basis on which to build up an agricultural faculty. The subject itself should be the unit, and sufficient instructors should be provided to develop it and make it attractive. The contention that more instructors are not needed until there is more demand for instruction is not believed to be sound or reasonable; and the inference from it that these instructors will be supplied when the demand has asserted the need of them is evidently not borne out by the returns given above, probably because when the time came there was lack of funds. This view point, it is believed, has done more than any other single thing to obscure the needs of the agricultural departments and to retard their development.

The development of agricultural education has proceeded slowly, and interest and confidence in it have been won by persistent and patient labor. The agricultural course requires special attention from the instructors in that department to popularize it and to secure the confidence of the farmers in it. It has been suggested that interest in this department of the colleges is usually found to be about in propor-

tion to the number of instructors, and within certain limits this is believed to be true. If a student upon entering college finds scanty provision made for instruction in agriculture, whereas other departments are well equipped and offer greater inspiration for work, he is quite likely to drift over into those other courses, or take only a half-hearted interest in his work; and he certainly will not become an ardent missionary for the agricultural course of that college after he graduates and goes forth to his life work.

The spectacle of the college with a goodly number of students in agriculture still clinging to the single "professor of agriculture," who perhaps divides his time with the experiment station and farmers' institute work, is not inspiring or one for any State to be proud of in this day. Every agricultural State should have progressed beyond that stage, and if it has not is it any surprise that it finds little demand for agricultural education?

We are making much progress in working out the methods of teaching agriculture, and in giving it pedagogic form; and a number of States are making encouraging progress in differentiating the teaching force and in training specialists for various branches of the subject. The example of the institutions which have thus developed and differentiated the subject has had a great influence in giving dignity and respect to that course, in arousing the interest and securing the confidence of farmers, and in placing agricultural instruction on a higher plane. But we can not claim as a whole to have done the subject full credit yet, or to have placed the course on a par with some others in the institution. The need for men of agricultural training, and the generally favorable public sentiment at present, give agriculture a strong claim for support.

The work of the experiment stations is judged quite largely by the outside public through their publications. These have changed in many ways since the stations were organized. They have been systematized and improved in general appearance, they are confined more largely to reports of investigation and experiment, and the work which they report is unmistakably higher in general character, indicating that more intricate problems are now commanding attention.

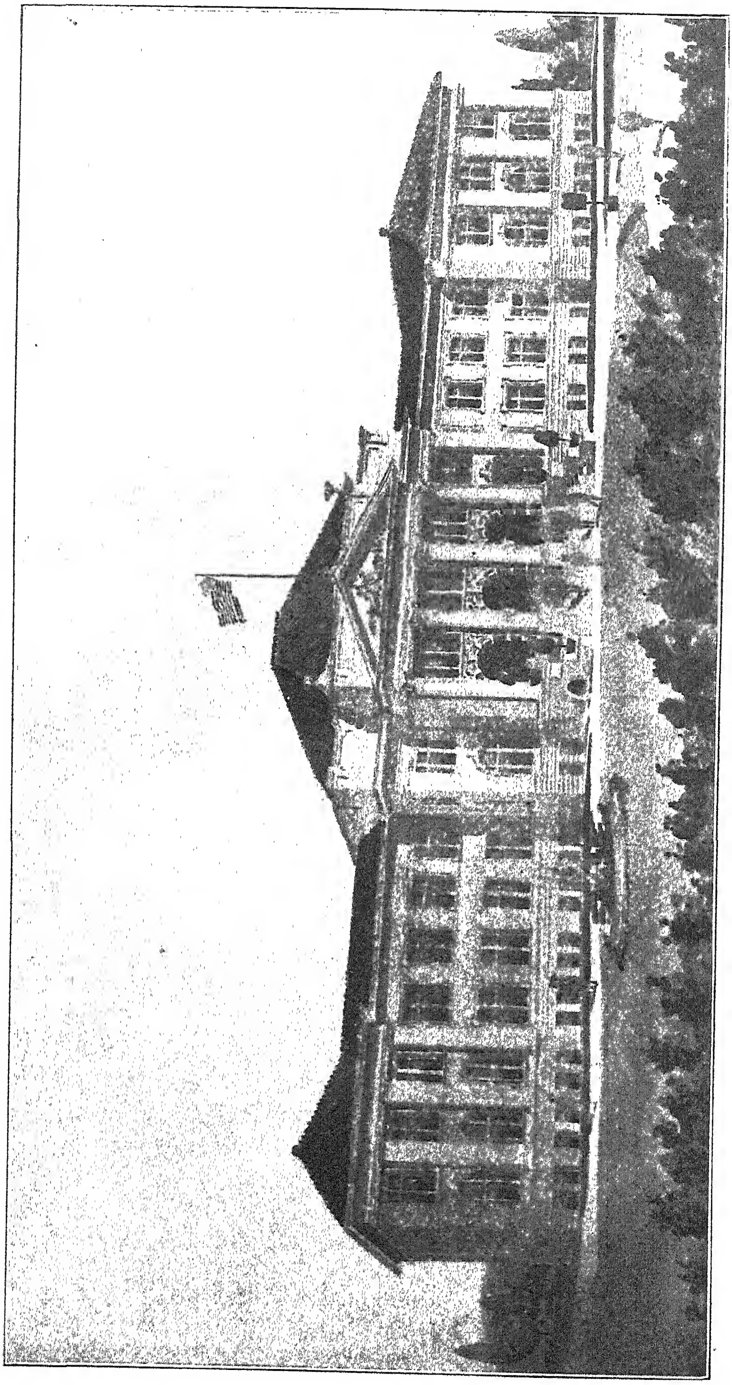
But the number of bulletins and reports issued by the stations has not changed materially in the past decade. In a way this is a good indication, for it suggests what observation confirms, that closer attention is being paid to investigation and less to compiling what has already been known. As a matter of fact, station men are now so occupied with their researches and experiments that very many of them find difficulty in getting time for writing bulletins. Furthermore, the expense for printing and mailing, where there are no special funds for this, has about reached the maximum which the

stations feel they can afford, without crippling some lines of research for which there is pressing need. There is hardly a station whose publications are not paid for by the State that does not have to withhold material from publication for lack of funds, and this is one of the places where relief is much needed.

While the number of bulletins and reports issued by the stations has remained practically the same for ten years past, the combined mailing list has increased more than one-third, necessitating a corresponding increase in the size of the editions. The list now aggregates 685,300 names. It varies greatly, of course, ranging from 1,500 in the case of the Alabama Canebrake Station, to 45,000 in the case of the Ohio Station and 45,500 in the case of the New York State Station. The Michigan Station has 35,000, Massachusetts 32,000, North Carolina 26,000, and Illinois over 25,000; while Kansas, Mississippi, Nebraska, Oklahoma, and Texas each have 20,000 or over. Thirty-six of the stations have from 9,000 to 10,000 names or over, and twenty-three stations have over 12,000 names on their mailing lists. The average for all the experiment stations, excluding one small station which has no regular mailing list, is considerably over 13,000 names.

During the past fiscal year the stations issued 393 bulletins and reports, exclusive of circulars, pamphlets, newspaper bulletins, and the like. These regular publications aggregated 15,093 pages of matter, which, considering their general character, represent a very creditable contribution to the sum of agricultural information. The aggregate number of these bulletins and reports distributed to persons on the mailing lists was approximately six and one-half million copies during the year. This does not include, of course, the very considerable number sent out by every station to applicants not on their regular mailing lists, nor does it include the newspaper bulletins issued in considerable numbers by several of the stations, or other more fugitive publications for which we have no returns. Nineteen circulars were issued in an aggregate edition of 322,000 copies.

When it is considered that in addition to these publications and to responding to a large and increasing correspondence, experiment station men last year devoted 2,131 days to farmers' institute work, and gave instruction in various branches of agriculture to about 10,000 students, it will be seen that as an agency for the dissemination of information relating to improved methods of agriculture and the progress of agricultural investigation, the experiment stations of this country are a very potent factor, and are in a position to wield a very broad influence for good.



AGRICULTURAL HALL, NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

NEW AGRICULTURAL BUILDING AT THE NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

A new building, to be known as Agricultural Hall (Pl. I), is in process of erection at the North Carolina College of Agriculture and Mechanic Arts, which will mark a noteworthy step in the development of agricultural instruction at the college. It will be, when completed, one of the largest and best equipped agricultural buildings in the South. It will place the agricultural department of the college on a par with any in the institution, and will add very materially to its facilities for instruction. The steady growth of interest in the agricultural courses, which has been going on within the past few years, has made these added facilities a necessity.

The new building is designed to be the central feature of a new group of buildings which are in contemplation, viz, a main stock barn, a veterinary building, a horticultural building, a building for agricultural engineering, and a dormitory for agricultural students. These will be located in accordance with a general plan which has been prepared by a landscape architect for the further development of the grounds of the institution.

The agricultural building will make provision for the administrative offices of the department of agriculture, and will include class rooms and laboratories for the departments of agronomy, animal husbandry, dairying, veterinary science, and biology in the college. It will also provide improved facilities for such college officers as are connected with the experiment station, for whose station work special research laboratories and other rooms are set apart.

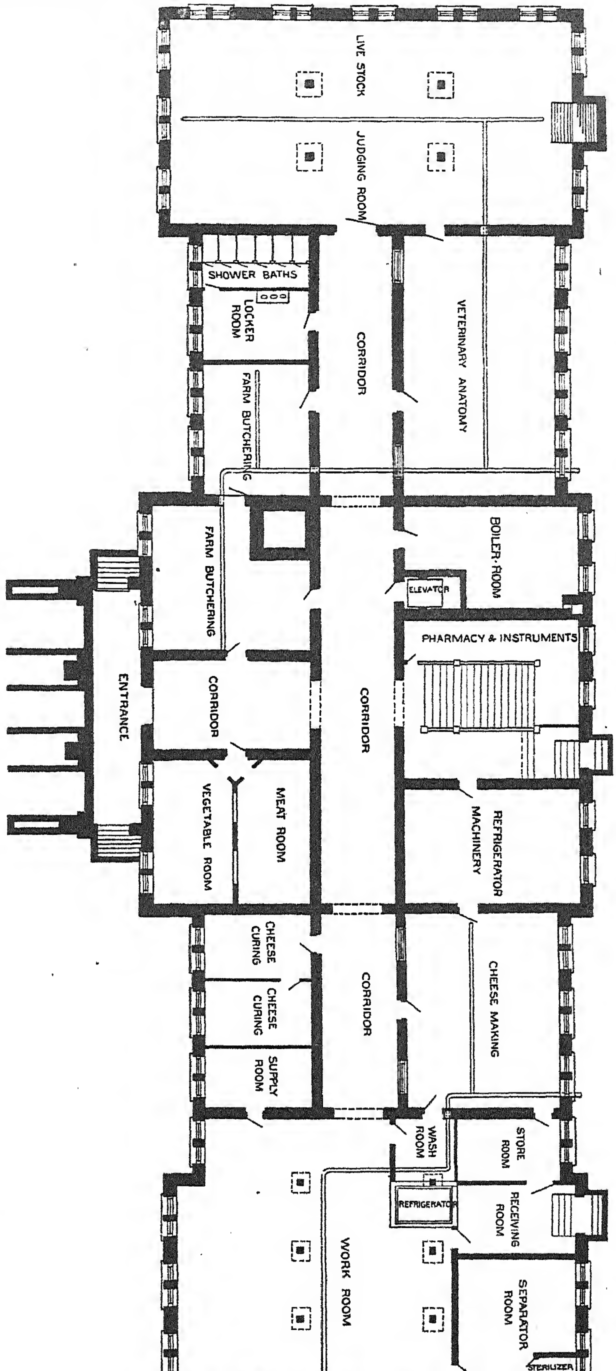
The building will have a frontage of 208 feet by a depth of 74 feet, and will be two stories high above a basement of full height, and amply lighted. In effect, therefore, it will be a three-story building. The basement floor (Pl. II) will be devoted to the departments of animal husbandry and dairying, with a large live stock judging room, rooms for farm butchering, butter and cheese rooms, etc. There will be a refrigerating plant for cooling six separate cold-storage rooms to different temperatures.

The first floor (Pl. III) will contain a laboratory and class rooms for soil physics, an agronomy laboratory, a farm machinery room, and a dairy laboratory and class room. There will also be a library connecting

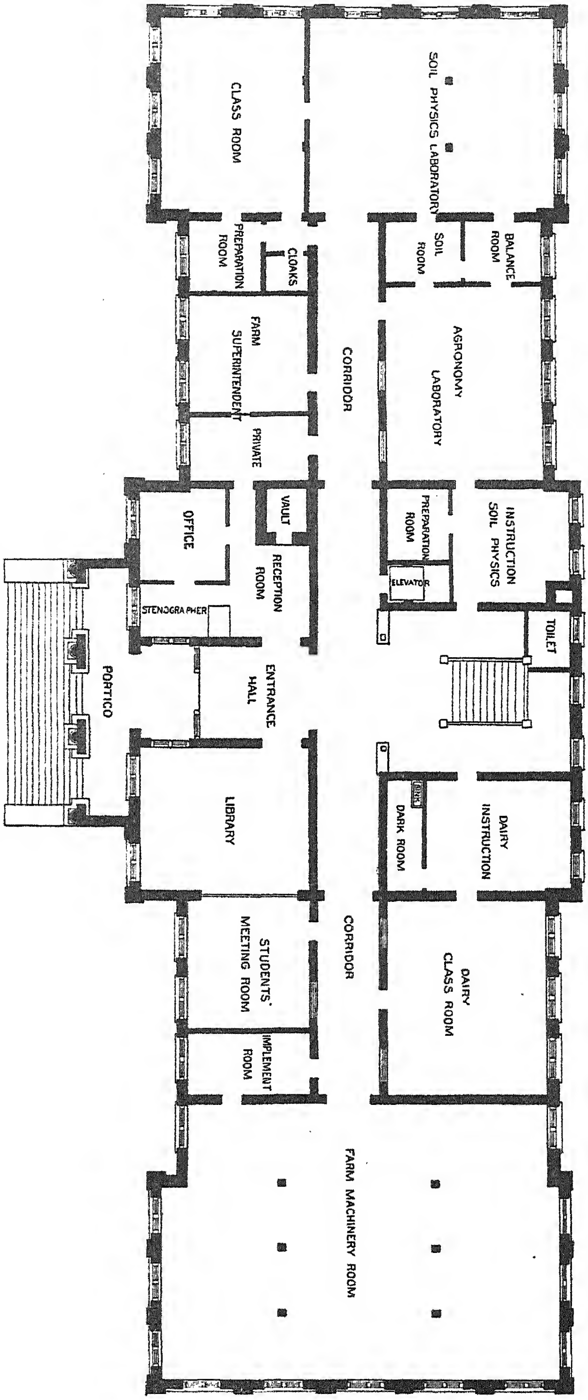
with a students' meeting room, and offices for the professor of agriculture and the farm superintendent. The second floor (Pl. IV) will be devoted mainly to botany, veterinary science, and bacteriology. There will be botanical, bacteriological, plant disease, and physiological laboratories, class rooms for veterinary science, botany, and zoology and physiology, together with a veterinary pharmacy, incubator rooms, storerooms, and offices.

An elevator extends from the basement to the second story, and a fireproof vault is provided on the main floor. The class rooms for veterinary science and botany on the second floor are so arranged that they may be thrown together, providing a large lecture room for public gatherings.

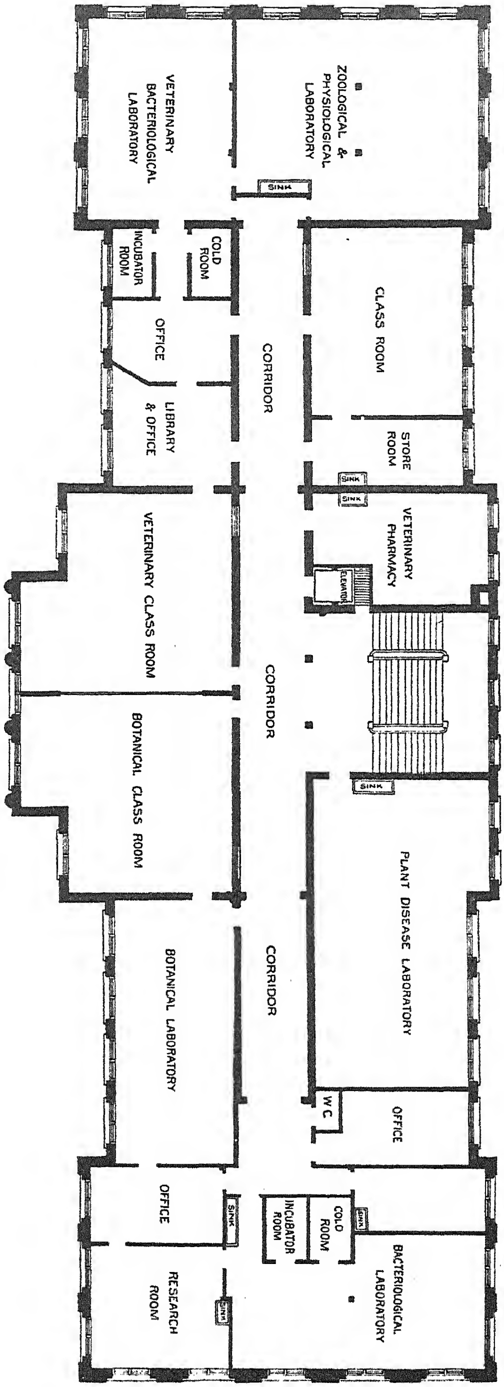
The building is constructed of buff pressed brick and granite. It has a roof of red tile, and all outside metal work is of copper. The inside walls are of face brick, painted, and the building is of slow-burning construction throughout. Heat will be supplied from the central heating plant. The cost of the building, with equipment, will be about $100,000.



BASEMENT PLAN, AGRICULTURAL HALL, NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.



FIRST-FLOOR PLAN, AGRICULTURAL HALL, NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.



SECOND-FLOOR PLAN, AGRICULTURAL HALL, NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The colorimetric estimation of phosphates, second method, O. SCHREINER and B. E. BROWN (*Jour. Amer. Chem. Soc., 26 (1904), No. 11, pp. 1463–1468*).—The method proposed is as follows:

"Measure out a convenient volume of the solution to be estimated, usually 50 cc., into an evaporating dish, add 1 drop of ammonia water, and 2 or 3 drops of the ammonium oxalate solution; evaporate to dryness on a water bath. To the cooled dish add 1 cc. of the magnesia reagent, work up the residue well with a glass rod and then allow to stand about 2 hours. The precipitated magnesium ammonium phosphate is then washed as follows: Add about 5 cc. of the ammonium hydroxid wash liquid to the dish, washing down the sides, and then pour the liquid through a small filter.

"Repeat this operation five times, then wash down the filter and funnel until the filtrate measures approximately 50 cc.; then rinse the dish once with about 5 cc. of cold water, and pour through the filter in such a way as to wash the filter; reject the washings and put a clean salt mouth bottle or other receptacle under the funnel. Add 5 cc. of nitric acid to the dish, working this about with the glass rod and pour through the funnel in such a manner as to wet all the inside of the funnel; then wash the dish five times with hot water (about 5 cc. each), and continue washing the filter until about 45 cc. of the filtrate have been obtained. To the cooled liquid add 4 cc. of the ammonium molybdate solution and, after 20 minutes, read against the standard colorimetric phosphate solution."

The following reagents are required:

"(1) *Ammonium molybdate solution.*—Fifty grams of the pure salt in 1 liter of solution.

"(2) *Nitric acid.*—Specific gravity 1.07.

"(3) *Standard phosphate solution.*—0.5045 gm. of pure freshly crystallized sodium phosphate, $Na_2HPO_4 . 12H_2O$, is dissolved in water, 100 cc. of nitric acid (sp. gr. 1.07) added, and the whole diluted to 1 liter. The nitric acid is added to lessen the contamination with silica from the glass. One cubic centimeter = 0.0001 gm. P_2O_5.

"(4) *Standard colorimetric solution.*—This is prepared by diluting 10 cc. of the standard phosphate solution to about 80 cc. and then adding 9 cc. of nitric acid, 8 cc. of ammonium molybdate solution, and making up to 100 cc. After standing 20 minutes it is ready for use. Each cubic centimeter of this colorimetric solution is equal to 0.00001 gm. P_2O_5.

"(5) *Ammonium hydroxid.*—Reagent.

"(6) *Ammonium hydroxid wash liquid.*—One part of strong ammonia water (sp. gr. 0.9) and 9 parts of water. This liquid should be practically free from silica, and for this reason is best prepared from redistilled ammonia water.

"(7) *Ammonium oxalate.*—Saturated solution.

"(8) *Magnesia reagent.*—Dissolve 13 gm. of magnesium chlorid, $M_gCl_2.6H_2O$, and 20 gm. of ammonium chlorid, NH_4Cl, in about 900 cc. of water, add 50 cc. of strong ammonia water (sp. gr. 0.9) and dilute to 1 liter. One cubic centimeter of this solution will precipitate 3.5 mg. of P_2O_5.

"(9) *Filter paper.*—This must be free from silica. Schleicher and Schüll's No. 589 or 590, 7 cm. has been found to be very satisfactory for this colorimetric work."

The determination of citric-acid-soluble phosphoric acid in Thomas slag, O. Böttcher (*Ztschr. Angew. Chem., 17 (1904), No. 29, pp. 988-990*).—The author defends his method against Sorge's criticism (E. S. R., 15, p. 1051), claiming that if the method is carried out as expeditiously as it should be there is no error due to solution of the ammonium-magnesium phosphate.

The action of water upon the phosphates of calcium, F. K. Cameron and A. Seidell (*Jour. Amer. Chem. Soc., 26 (1904), No. 11, pp. 1454-1463*).—A series of studies are reported from which "it appears that tricalcium phosphate and monocalcium phosphate are alike in their conduct toward water in that both are very much hydrolyzed and decomposed.

"With tricalcium phosphate, former study in this laboratory (E. S. R., 16, p. 222) makes it appear improbable that final equilibrium conditions were obtained in the work here described, but with the monocalcium phosphate there can be but little doubt that the results here given do represent final conditions, and that it is safe to say that with both tri- and mono-calcium phosphate the amount of decomposition and the concentration of the resulting solution at the temperature employed is dependent upon the proportion of the mass of solid phosphate to the mass of water.

"Dicalcium phosphate is unlike the mono- and tri-compounds, in that it is, relatively speaking, but slightly decomposed by water, and appears to dissolve mainly as such. In other words, it is the only phosphate of calcium which is stable in water under ordinary conditions."

The gravimetric determination of calcium, E. Kettler (*Ztschr. Angew. Chem., 17 (1904), No. 21, pp. 685, 686*).—The author calls attention to the unreliability of the process of converting calcium oxalate into carbonate or oxid and proposes the use of sulphuric acid to convert the lime into sulphate as a more accurate procedure.

The gravimetric determination of calcium, O. Brück (*Ztschr. Angew. Chem., 17 (1904), No. 28, pp. 953, 954*).—The author states that the conversion of lime precipitates into sulphate before weighing, as proposed by Kettler, is unnecessary, as accurate results can be obtained by conversion into carbonate by heating with ammonium carbonate.

The gravimetric determination of calcium, E. Kettler (*Ztschr. Angew. Chem., 17 (1904), No. 39, pp. 1488, 1489*).—The author points out that his conclusions regarding the unreliability of the method of converting lime precipitates (oxalate) into oxid or carbonate by ignition were based upon a series of comparative tests, which are enumerated.

The determination of potash in soils, A. Levi (*Staz. Sper. Agr. Ital., 37 (1904), pp. 595-599; abs. in Chem. Centbl., 1904, II, No. 17, p. 1255*).—A form of the ordinary process is described.

Improvement of the old Benning's method for determining the clay content of soils, Emmerling (*Chem. Ztg., 28 (1904), No. 79, p. 940*).—It is stated that the addition of a coloring matter (malachite green or methyl violet) to the solution containing the soil in suspension facilitates the separation of the clay.

The determination of nitrogen in organic compounds, H. C. Sherman and M. J. Falk (*Jour. Amer. Chem. Soc., 26 (1904), No. 11, pp. 1469-1474*).—This article reports the results of comparisons on benzamid, betain hydrochlorid, acetanilid, naphthylamin, diphenylamin, and cinchonin sulphate, of the Kjeldahl-Wilfarth method, with and without potassium permanganate, the Gunning method, and the

Dyer modification of the Gunning method. In the case of each method digestion was continued for different periods of time.

A comparison of the Arnold-Wedemeyer process, using copper, with the Dyer process, without copper, on black pepper, white pepper, tobacco, cinchonin sulphate, and impure quinine, is also reported. The results are summarized as follows:

"(1) So many substances yield nitrogen compounds which are colorless in hot sulphuric acid that the disappearance of color from the digesting solution gives little indication of the extent to which ammonification has taken place. When either mercury or potassium sulphate was used alone it was always necessary to digest the solution after it had become colorless in order to secure all of the nitrogen as ammonia. The temperature of the boiling solutions and the total time of boiling are fully as important as the disappearance of color.

"(2) Proteids and simple amids, even of aromatic acids, yield their nitrogen as ammonia without especial difficulty. When treated by either the Wilfarth or the Gunning method, about 98 to 99 per cent of the total nitrogen present has usually been converted to ammonia by the time the solution becomes colorless. By continuing the boiling for at least 2 hours longer or by the careful use of potassium permanganate, most of the remaining nitrogen can be obtained. The complete ammonification of the nitrogen of proteids and amids is more readily and certainly accomplished by the use of both mercury and potassium sulphate, as recommended by Dyer, the boiling being continued for at least one-half hour after the solution becomes colorless, or for at least 1 hour from the time the potassium sulphate is added.

"(3) Aromatic amins also yield colorless solutions before all of the nitrogen has reached the form of ammonia. The amount of nitrogen lost by using mercury or potassium sulphate alone and stopping the digestion as soon as the solution becomes colorless, is greater with naphthylamin than with anilin (acetanilid), and greater with diphenylamin than with naphthylamin. Boiling for 2 hours longer with either of the reagents alone does not always secure complete ammonification. This is most readily accomplished by using both mercury and potassium sulphate, as in the case of proteids.

"(4) Many alkaloids and certain of the so-called 'nitrogenous extractives' of plant and animal substances, such as betain and creatin, yield solutions in sulphuric acid which readily become colorless on boiling after addition of mercury, but less readily yield their nitrogen as ammonium sulphate. In such cases entirely erroneous results are obtained if ammonification is assumed to be complete when the solution becomes colorless. The use of permanganate to complete the decomposition does not always yield correct results. Potassium sulphate alone sometimes gives much better results than are obtained by the use of mercury alone, probably because the boiling-point of the digesting liquid is higher and a longer time is usually required to obtain a colorless solution. Boiling for 1 hour with both mercury and potassium sulphate appears to be sufficient for the 'nitrogenous extractives' but not for all alkaloids.

"(5) Very resistant substances, such as alkaloids, coal, etc., should be boiled with sulphuric acid, mercury, and potassium sulphate for at least 2 hours after the solution becomes colorless, and for not less than 3 hours in all. No advantage has been found in the use of copper in addition to the reagents mentioned, but with the coals tested slightly higher results were obtained by the careful use of permanganate at the end of the 3 hours' boiling. On account of the danger of loss of nitrogen through too violent a reaction of the permanganate, it is advisable to make the determinations in duplicate, using permanganate in one case and omitting it in the other.

"(6) For all samples in which the nitrogen exists essentially as proteids or albuminoids and related compounds, including the so-called 'nitrogenous extractives,' and other amids and amino-compounds, it is only necessary to use mercury and potassium sulphate, as recommended by Dyer, and to boil for one-half hour after the solution

becomes colorless, or in the case of quickly decolorized samples, for at least 1 hour from the time the potassium sulphate is added.

"(7) The Dyer modification appears to combine the advantages of the other methods (Kjeldahl-Wilfarth, Gunning, and Arnold-Wedemeyer) now recommended by the Association of Official Agricultural Chemists for the determination of nitrogen in organic compounds."

The quantitative determination of phosphoric acid and nitrogen in organic substances by means of sodium peroxid, F. VON KONEK (*Ztschr. Angew. Chem., 17 (1904), No. 26, pp. 886–888; abs. in Chem. Centbl., 1904, II, No. 5, p. 472*).—In a previous article the author showed how the phosphorus of organic matter could be quantitatively converted into phosphoric acid by ignition with sodium peroxid. In this article he points out how the nitrogen may also be quantitatively converted into nitric acid by the same process, namely, by ignition in a nickel-lined cylinder with close-fitting cap, the nitric acid in the resulting product being determined by the Devarda method.

The quantitative determination of organic nitrogen by means of sodium peroxid, F. VON KONEK and A. ZOHLS (*Ztschr. Angew. Chem., 17 (1904), No. 31, pp. 1093–1095; abs. in Chem. Centbl., 1904, II, No. 11, p. 845*).—The authors report further studies of Konek's method, noted above, in which it was found that sodium peroxid does not completely convert the nitrogen of pyridin, chinolin, and similar compounds, or of aromatic nitrogen compounds, into nitric acid.

On the other hand, it proved reliable and efficient in case of aliphatic compounds, and was successfully employed on various kinds of meals as follows: Dry 0.5 gm. of the meal at 100 to 102° C., transfer to a nickeled steel cylinder, and mix first with 12 gm. of sodium peroxid and later stir in 5 to 6 gm. of the same substance and 1 gm. of persulphate-tartaric acid mixture (2 parts of KSO_4 and 1 part of tartaric acid). Screw down the cover so that it is water-tight and fire the mixture with a glowing iron wire. Determine the nitric acid in the resulting product by the Devarda method.

The use of sodium peroxid in analysis, H. H. PRINGSHEIM (*Ztschr. Angew. Chem., 17 (1904), No. 38, pp. 1454, 1455*).—The author states that by using a smaller amount of sodium peroxid (3 to 5 gm.) than that recommended by Konek violent explosion is avoided when the mixture is fired and the necessity for the use of a close-fitting cover to the cylinder is obviated. A method of this kind has been sucessfully used by the author in the determination of the halogens, phosphorus, and arsenic.[a]

The determination of nitrogen, E. JALOWETZ (*Allg. Ztschr. Bierbrau. u. Malzfabrik., 1904, May; abs. in Chem. Centbl., 1904, II, No. 15, p. 1068*).—The author calls attention to the error which may be introduced by alkali dissolved from the glass flasks and tubes used in the distillation apparatus in the Kjeldahl method. He reports determinations of nitrogen in barley in which this error corresponded to 0.4 to 1.2 per cent of protein.

To what extent does the alkalinity of the glass apparatus affect the accuracy of the Kjeldahl determination of nitrogen? K. BARELT and H. SCHÖNEWALD (*Wchnschr. Brau., 21 (1904), p. 523; abs. in Chem. Centbl., 1904, II, No. 15, p. 1068*).—The errors due to solution of alkali from the glass were somewhat smaller than those found by Jalowetz (noted above), but increased with the increase of the period of distillation and were greater with new apparatus than with old.

An apparatus for the determination of nitrogen, NICOLAS and DELAUD (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 20–21, pp. 1193, 1194*).—The apparatus described is a modification of that of Porcher and Brisac (E. S. R., 14, p. 631) designed for the determination of nitrogen by the decomposition of ammonium salts under the action of sodium hypobromite.

[a] Ber. Deut. Chem. Gesell., 36 (1903), p. 4244.

A method for the determination of ammonia and albuminoid nitrogen in water, J. Effront (*Monit. Sci., 4. ser., 18 (1904), pp. 669–674; abs. in Chem. Centbl., 1904, II, No. 17, pp. 1253, 1254*).—The method described is based on the reduction of an alkali hypochlorite to chlorid by the action of ammonia and albuminoid substances, the extent of reduction, and consequently the amount of ammonia and albuminoid nitrogen present, being measured by the chlorid formed.

The examination of waters and water supplies, J. C. Thresh (*London: J. & A. Churchill, 1904, pp. 476; rev. in British Med. Jour., 1904, No. 2287, p. 1176*).

A review of progress in the chemistry of waters, especially natural and artificial mineral waters, A. Goldberg (*Chem. Ztg., 28 (1904), No. 77, pp. 908–912*).—This report summarizes, with numerous references to literature, investigations relating to water supply and chemical technology of waters, general and analytical investigations, and special investigations with reference to natural and artificial mineral waters.

The determination of the permanganate requirements of waters containing large amounts of chlorids, Ruppin (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, p. 418; abs. in Chem. Centbl., 1904, II, No. 20, pp. 1479, 1480*).—Attention is called to the fact that in alkaline solution sodium chlorid to the extent of 8 gm. per liter in water is without effect on permanganate solution. When the solution is acid, however, the chlorids are very active in reducing the permanganate. An iodometric method of determining the amount so reduced is described.

Determination of manganese in drinking water, G. Baumert and P. Holdefleiss (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), pp. 177–181; abs. in Analyst, 29 (1904), No. 343, p. 320*).—An iodometric method for determining small quantities of manganese in well waters is described.

The occurrence of mannan in trees, roots, and fruit, F. H. Storer (*Bul. Bussey Inst., 3 (1904), pt. 4, pp. 69–73*).—A list supplemental to that previously noted (E. S. R., 15, p. 264) is given, in which the author notes the occurrence of mannan in a number of specimens of woods, fruits, etc.

A text-book of physiological chemistry, O. Hammarsten, trans. by J. A. Mandel (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. VIII+703*).—The translation of this well-known text-book was made from the enlarged and revised fifth German edition.

A laboratory manual of physiological and pathological chemistry, E. Salkowski, trans. by W. R. Orndorff (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. IX+263*).—The German edition has been previously noted (E. S. R., 15, p. 852).

Introduction to the rapid testing of the more important foods and condiments, S. Lenobel (*Anleitung zur raschen Prüfung wichtiger Lebens- und Genussmittel. Vienna and Leipzig: A. Hartleben [1904], pp. IV+29*).—Simple methods for testing milk, butter, cheese, eggs, flour, lard, coffee, and other foods and food products are given, the author's plan being to provide an introductory text-book.

Methods for the detection of renovated butter, G. E. Patrick (*U. S. Dept. Agr., Bureau of Chemistry Circ. 19, pp. 3*).—Description of methods used in cooperative work by the Association of Official Agricultural Chemists.

The examination of fat by means of the Zeiss-Wollny refractometer, K. Farnsteiner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, pp. 407–411, fig. 1*).—The use of a special thermometer in connection with the refractometer is discussed.

The estimation of fat in meat and meat products by means of Gerber's acid butyrometer, T. Kita (*Arch. Hyg., 51 (1904), No. 2, pp. 165–178*).—Gerber's acid butyrometer, according to the author's investigations, may be satisfactorily used for determining fat in meat and meat products. He recommends dissolving the

finely chopped material in sulphuric acid (specific gravity 1.820 to 1.825) and water 1:1. The minutiæ of the method are described.

A comparative refractometer scale for use with fats and oils, A. E. LEACH and H. C. LYTHGOE (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1193–1195, fig. 1*).—A slide rule for use in reading indexes of refraction with the Zeiss butyro-refractometer is described. According to the authors "readings may be obtained on the scale of the butyro-refractometer at different temperatures without first transforming them into indices of refraction; readings in indices of refraction may be obtained at different temperatures without calculation, and readings on either refractometer scale may be readily transformed into readings on the other."

The iodin number of several fats and waxes determined by the Wijs method, H. L. VISSER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, p. 419*).—Among other materials lard, cocoa butter, nutmeg butter, wool fat, yellow wax, Japan wax, cocoanut fat, almond oil, linseed oil, castor oil, and olive oil were examined.

Apparatus for determining the melting point of resistant substances, F. KUTSCHER and OTORI (*Ztschr. Physiol. Chem., 42 (1904), No. 3, pp. 193, 194, fig. 1*).—In the apparatus described, the thermometer is inserted in a test tube contained in a long-necked quartz-glass flask. The authors consider that this form of apparatus is especially satisfactory as there is no liquid in the flask and unpleasant results from breaking are thus done away with.

The identification of yeast extract in meat extract, M. WINTGEN (*Arch. Pharm., 242 (1904), No. 7, pp. 537, 538*).—The proposed method depends upon the observed differences in the clearness of the solution when the proteids are salted out with zinc sulphate in the determination of albumoses by Bömer's method.

A new method of estimating cellulose quantitatively in foods and feces, O. SIMON and H. LOHRISCH (*Ztschr. Physiol. Chem., 42 (1904), No. 1–2, pp. 55–58*).—The principle upon which the method described is based is that although cellulose is insoluble in 50 per cent potassium-hydroxid solution it may be dissolved if hydrogen peroxid is also used and then precipitated quantitatively from the solution by alcohol.

In practice, 10 gm. of dried material is treated with 50 per cent potassium-hydroxid solution for an hour on the water bath at 100° C. and allowed to cool. Three or 4 cc. of hydrogen peroxid is then added, which breaks the incrusting cellulose cell walls and brings the lignin and pectin into solution and at the same time acts as a bleaching agent. If any material remains undissolved it may be brought into solution by again heating on a water bath 30 to 45 minutes.

The cellulose is precipitated with 96 per cent alcohol. When the alcohol does not mix with the alkaline liquid it is advisable to add 6 or 7 cc. of concentrated acetic acid. After filtering through a hardened filter the cellulose is brought into a beaker glass, washed with an abundance of water, filtered on a weighed filter, washed with water, dilute acetic acid, alcohol and ether, dried and weighed.

Critical and experimental studies on the calorimetry of urine, K. FARKAS and M. KORBULY (*Arch. Physiol. [Pflüger], 104 (1904), No. 9–12, pp. 564–607*).—The authors find that when aqueous solutions of urea are dried with or without the addition of hydrochloric acid or sodium carbonate a loss of energy is sustained. The loss of energy is least when the solution is evaporated in vacuum at ordinary room temperature without added material. The addition of hydrochloric acid hinders a loss of nitrogen but not of energy. The relation between nitrogen and energy losses is not constant.

The use of cellulose blocks for absorbing and drying urine in the authors' opinion is in most cases unnecessary and involves error except when the ash content is very high. Small amounts of the dry matter of human urine or that of animals will burn in the calorimeter completely without the addition of any other substance. Adding hydrochloric acid or oxalic acid is unnecessary. The loss of nitrogen is parallel to that of energy, though no fixed relation between the two could be pointed out. The

former loss is especially great with alkaline urine which contains a large proportion of preformed ammonia.

The authors recommend as the most satisfactory procedure for urine combustions the direct evaporation of the urine in a platinum capsule to be used in the bomb, employing a sufficient amount of urine to produce 1 to 1.5 calories when burned. This should be evaporated in a vacuum at ordinary temperature without the use of a cellulose block or any additional substance. Methods of introducing corrections for the energy on the basis of the loss of nitrogen are discussed.

Determination of sulphur and phosphoric acid in foods, feces, and urine, J. A. LeClerc and W. L. Dubois (*Jour Amer. Chem. Soc., 26 (1904), No. 9, pp. 1108–1113*).—Comparisons of Berthelot's calorimetric, Parr's calorimetric, and Osborne's sodium peroxid methods for sulphur. The Osborne method was found the most satisfactory and reliable.

The identification of corn meal in bread, D. Ottolenghi (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 189–193*).—In the method described dried bread is treated with potassium-hydroxid solution, filtered, evaporated to dryness, and extracted with boiling isoamylalcohol for several hours. If the bread is free from maize flour the resulting yellow-brown liquid when filtered is clear or slightly opalescent. If the bread contains maize meal, however, it is more or less opaque. When the cold liquid is filtered the addition of benzol crystals causes more or less opalescence if maize is present, otherwise it remains clear. Other differences are pointed out and the method is described in detail.

The gravimetric estimation of boric acid by perforation with ether, A. Partheil and J. A. Rose (*Arch. Pharm., 242 (1904), Nos. 6, pp. 478–480; 7, pp. 481–488*).—The method recommended consists in general in incinerating the material, extracting the borate from the ash with ether, evaporating to dryness, and weighing. In the case of oleomargarine an aqueous extract is evaporated to dryness, incinerated, and treated with ether.

The estimation of boric acid as phosphate, F. Milius and A. Meusser (*Ber. Deut. Chem. Gesell., 37 (1904), pp. 397–401; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 222, 223*).—A study of the estimation of boric acid as boryl phosphate.

The influence of hydrogen peroxid on enzyms, A. J. J. Vandevelde (*Beitr. Chem. Physiol. u. Pathol., 5 (1904), No. 11-12, pp. 558–570*).—Hydrogen peroxid increased the action of rennet, pepsin, trypsin, and the proteolytic ferment of milk, the increase being proportional to the concentration of the reagent. The increased activity was noticeable in the swelling of the material treated, as well as in the rapidity of solution. Variations in the effect of the reagent on the different ferments studied are discussed.

Tables for chemical calculations, H. L. Wells (*New York: Henry Holt & Co., 1904, pp. 60*).

A new apparatus for preparing hydrogen sulphid, carbon dioxid, or hydrogen, H. Arzberger (*Österr. Chem. Ztg., 7 (1904), No. 21, pp. 489, 490*).

The use of electricity in laboratory operations, W. Zielstorff (*Chem. Ztg., 28 (1904), No. 86, pp. 1026–1028*).—Devices in which electric currents are used for heating extraction apparatus, propelling shaking machines, and heating drying ovens are described.

Yearbook of chemistry, R. Meyer et al. (*Jahrb. Chem., 13 (1903), pp. XII+600*).—This is a biographical and bibliographical review of the more important advances in pure and applied chemistry during the year 1903.

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1904, edited by H. W. Wiley (*U. S. Dept. Agr., Bureau of Chemistry Circ. 20, pp. 19*).—This contains reports of committees on recommendations of referees of the association and the action taken by the association upon these recommenda-

tions together with a list of the officers, referees, and committees of the association for 1905. A previous number of the Record (E. S. R., 16, p. 320) has given a summarized account of the proceedings of the association.

A select bibliography of chemistry, 1492–1902, H. C. Bolton (*Smithsn. Misc. Collect., 44, No. 1440, pp. 462*).—This is the second supplement to the Select Bibliography of Chemistry and covers the 5 years from 1898 to 1902, inclusive.

BOTANY.

Contribution to our knowledge of the development of Prunus americana, R. E. Buchanan (*Proc. Iowa Acad. Sci., 1903, pp. 77–93, pls. 3*).—The object of the investigation here reported was to throw light upon the time intervening between pollination and fertilization in the plum. It is commonly believed that although pollen is applied to the pistil and germinates, fertilization and subsequent development of the embryo is delayed for some time. Other observations were made in connection with pollination, fertilization, and development, the investigations being made with varieties of Americana and the Wild Goose type of plums.

The author's observations showed that the formation of flowers in the fruit buds began about the middle of July, agreeing in this respect with previous observations made in Wisconsin (E. S. R., 12, p. 22). In normal flowers of most varieties the pistils and stamens are of about the same height, and pollination occurs normally almost immediately upon the opening of the flowers. The fertilization is brought about almost entirely by the common honeybee, although a list of other insect visitors is given.

The pollen tubes were found to develop very shortly after the application of pollen to the stigma, and the process of fertilization is completed in from one to two weeks. The different members of the genus Prunus have two ovules, only one of which develops, and until the time of pollination there is no perceptible difference between the ovules. Soon after fertilization one of the ovules gains the ascendency and develops more rapidly than the other, resulting in the finally developed ovule.

It is a matter of common information that but few plums are produced in comparison with the number of flowers, and an examination showed that this varied with different varieties, many of the flowers apparently being defective. Self-sterility was found to be very marked in some species, a condition which is not confined to plums alone. This results in a diminished production; and another factor affecting the plum crop is the so-called June drop, which seems to be largely due to infertility.

A brief bibliography is appended.

The origin and nature of color in plants, H. Kraemer (*Proc. Amer. Phil. Soc., 43 (1904), No. 177, pp. 257–277*).—After briefly reviewing some of the literature relating to the nature of color in plants, the author divides these colors into two categories, those which are associated with the plastids or organized bodies in the cell, and those which occur in the cell sap or liquids of the cell. The so-called white colors are held to belong to neither class, the white appearance being due to reflected light.

Microscopical examinations of the different coloring substances did not give satisfactory results, and an attempt was made to consider the behavior of the extracted coloring substances toward chemical reagents. Nearly 100 different plants and parts of plants were investigated, and the reaction toward different chemicals is shown.

The conclusions of the author are that the white appearance in flowers and other parts of plants is due to the reflection and refraction of light in more or less colorless cells separated usually by large intercellular spaces containing air. The green color of plants is due to chlorophyll contained in the chloroplastids and is more or less constant in all plants. The yellow color substance in roots, flowers, and fruits is due to a pigment to which the author has given the name chromophyll. In the inner

protected leaf buds there is found a yellow principle, which has been termed etiophyll, which is contained in an organized body termed an etioplast. This etioplast does not appear to contain either starch or proteid substances.

The blue, purple, and red color substances in flowers are held in solution in the cell sap and are distinguished from the plastid colors by being insoluble in ether, xylol, benzol, chloroform, and similar solvents, but readily soluble in water and alcohol. Cell-sap colors are found in early or spring leaves and also in autumn leaves which correspond to the cell-sap colors of flowers.

The author considers that the chromoplastids of flowers and fruits have a special function in manufacturing or storing nitrogenous food materials, for the use of the developing embryo or developing seed. The chromoplasts in such roots as the carrot are utilized by the plant the second year. Cell-sap colors, like other unorganized cell contents, are held to be incident to physiological activity and of secondary importance in the attraction of insects.

Mannite as a possible reserve food in flowering plants, F. H. Storer (*Bul. Bussey Inst., 3 (1904), pt. 4, pp. 98–111*).—Investigations were undertaken to determine whether mannite and mannan accompany each other in plants or parts of plants which habitually contain mannan. The method of separation and tests are described, and in the case of oat hay, June hay, and the leaves of certain grasses mannite was found present, while negative results were obtained in many other cases.

Assimilation of atmospheric nitrogen through turf-frequenting fungi, C. Ternetz (*Ber. Deut. Bot. Gesell., 22 (1904), p. 267; abs. in Bot. Centbl., 96 (1904), No. 34, pp. 193, 194*).—Studies were made of the endotrophic Mycorrhiza found growing on the roots of certain ericads common on the Swedish moors. The roots were thoroughly washed with hydrochloric acid and distilled water, after which the fungus was separated and grown upon the media recommended by Winogradsky for cultures of *Clostridium pasteurianum*.

The fungus grew readily, and analyses showed that it had assimilated appreciable quantities of nitrogen from the air. When compared with the nitrogen assimilation of *C. pasteurianum*, the organism under investigation assimilated from 6 to 10 mg. of nitrogen for each gram of dextrose or more, while the Clostridium only assimilated 1 to 2 mg. per gram of dextrose consumed.

Recent experiments in soil inoculation (*Jour. Bd. Agr. [London], 11 (1904), No. 6, pp. 348–351*).—The failure of the Nitragin put on the markets a few years ago is commented upon, and an account given of recent investigations which seem to have given favorable results with organisms produced in a different way from those previously described. The failure of the Nitragin is believed to be due to the action of secretions produced by the seed in early stages of germination.

It was found possible to overcome this difficulty by sprouting the grain and then treating it with the bacterial culture, but this was difficult and often impossible to carry out. Under the new method of cultivation the bacteria are grown in media which it is believed will give them the necessary power of resistance, hitherto lacking. A tabular statement is given of 98 experiments with a number of leguminous plants, of which 81 gave favorable results.

Parasites as an aid in determining organic relationship, N. A. Cobb (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 845–848*).—The author argues that a critical study of the parasites of plants and animals will often aid in discovering specific and generic relationships of the hosts, as well as in following out other metamorphoses. Important suggestions will also be given regarding the physiological and chemical activity of the organisms.

New or noteworthy Philippine plants, II, E. D. Merrill (*Philippine Dept. Int., Bureau Govt. Labs. [Pub.], 1904, No. 17, pp. 47, pls. 3*).—Descriptions are given of a number of new species of plants, together with notes on some that have been

previously described. Many of the species enumerated are forest trees, and notes are given on their distribution, habits, etc.

Notes on useful plants of Kongo, II, E. DE WILDEMAN (*Pub. État Indépendant Congo, 1904, pp. 223–396, pls. 16, figs. 3*).—Notes are given on various medicinal plants, tropical fruits, particularly the papaya and guava, plants used in house construction, poisonous plants and their products, cacao and its cultivation, various ornamentals, and also the principal timbers of Kongo. In describing the timbers, notes are given on their distribution, vernacular and scientific names, uses, etc. A considerable number of plants new to science are described.

The vegetation of the Minbu District, Upper Burma, A. T. GAGE (*Rec. Bot. Survey India, 3 (1904), No. 1, pp. 141+VII, map 1*).—A description is given of the topography of the district, followed by a general sketch of the vegetation and a list of species observed, after which the different plants are described, according to their distribution, their economic and medicinal uses, etc.

ZOOLOGY.

A biological reconnaissance of the base of the Alaska peninsula, W. H. OSGOOD (*U. S. Dept. Agr., Division of Biological Survey, North American Fauna No. 24, pp. 86, pls. 7*).—A report is given on observations made during a short trip in 1902 to the base of the Alaska peninsula. The biological conditions in this country were investigated along the coast and in a portion of the interior. An account is given of the itinerary of travel, the life zones as determined for the region under investigation, and previous work done by other investigators. In addition to this general portion of the report, lists are presented of the mammals and birds observed during the trip.

Game laws for 1904, T. S. PALMER, H. OLDYS, and R. W. WILLIAMS, Jr. (*U. S. Dept. Agr., Farmers' Bul. 207, pp. 64, figs. 5*).—This bulletin contains notes on game legislation during 1904, and presents in a condensed form various regulations now in force relating to seasons, shipment, sale of game, and the acquisition of hunting licenses in the United States and Canada. Detailed statements regarding the laws and other regulations are arranged in alphabetical order under the names of the States.

Hunting licenses; their history, objects, and limitations, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Bul. 19, pp. 72, pls. 7*).—This bulletin is prepared for the purpose of furnishing general information regarding the history of hunting licenses for residents and nonresidents of the various States; the details, objects, and limitations of these licenses; and the present status of license legislation in the United States, with notes on the decisions of courts regarding the constitutionality of nonresident license laws. Brief notes are also furnished on hunting licenses in various foreign countries. The bulletin is furnished with an index of license legislation in the United States and Canada.

Mongoose (*Liga Agraria, 19 (1904), No. 3–4, pp. 106–108, figs. 2*).—Brief notes are given on the habits and economic importance of this animal in the destruction of snakes and other pests.

Destroying prairie dogs, A. T. PETERS and S. AVERY (*Nebraska Sta. Bul. 86, pp. 15*).—In the year 1900 experiments were begun for the purpose of exterminating prairie dogs. The numbers of these animals had greatly increased on account of the indifference of nonresident landowners. A copy is given of a law passed by the State legislature for the extermination of these animals.

In the destruction of prairie dogs in small colonies, carbon bisulphid is the favorite remedy with ranchmen, although the cost and labor in applying this remedy are considerable. In laboratory tests pocket gophers were used in the place of prairie dogs. Acetylene gas did not kill these animals after exposure for an hour. Carbon bisulphid rendered them unconscious almost instantly and produced death within 20

minutes. When water containing hydrogen sulphid was used the animals were killed almost instantly. This gas was considered 20 times as effective as carbon bisulphid.

A hydrocarbon oil obtained as a by-product in the manufacture of Pintsch gas gave results about equal to those obtained by carbon bisulphid. The same may be said for a hydrocarbon obtained from another gas works. Pintsch gas hydrocarbon gives off a heavy vapor which readily penetrates into the holes. The hydrocarbon obtained from coal gas is very similar to the Pintsch hydrocarbon but is somewhat less volatile.

In field experiments Pintsch hydrocarbon and carbon bisulphid were used. It is found necessary to go over a dog town very thoroughly every few days for about two weeks, treating all open holes. The hydrocarbons are not poisonous in the ordinary sense, and take fire less readily than carbon bisulphid. The cost of this application varies from 2 to 20 cts. per acre, according to the number of prairie-dog holes per acre. In the case of unusually large dog towns it is probably preferable to adopt a combination of poisoning and fumigation.

Jackal-proof fencing (*Agr. Jour. Cape Good Hope, 25 (1904), No. 5, pp. 560–563*).—Woven-wire fencing has been tested on a large scale in the Australian colonies and has given excellent results in protecting stock against the attacks of jackals. The expense is quite inconsiderable when compared with the saving of stock which would otherwise be destroyed by these pests.

South African jackals, P. J. Du Toit (*Agr. Jour. Cape Good Hope, 25 (1904), No. 5, pp. 569–572, pl. 1*).—The habits of the jackal are briefly discussed, and notes are given on poisoning and other methods of extermination. In Cape Colony 4 species of jackals are recognized, and detailed descriptive notes are given on these species with suggestions regarding the most successful methods of exterminating them. The species of jackal found in Cape Colony are *Canis mesomelas*, *Proteles cristatus*, *Otocyon megalotis*, and *Vulpes chama*.

Protecting nursery stock and young trees from rabbits and hares (*Agr. Gaz. New South Wales, 15 (1904), No. 8, p. 744*).—No success is reported in preventing the attacks of rabbits by the rubbing of blood, liver, or other disagreeable substances upon trees. The use of traps is recommended in the place of this device.

Beneficial and harmful mammals and birds (*Rev. Gén. Agron.* [*Louvain*], *13 (1904), Nos. 9, pp. 370–378; 10, pp. 416–426, figs. 2*).—A large number of mammals and birds are discussed with special reference to their economic relations with agricultural industry. Attention is called to the feeding habits of birds and mammals which are particularly beneficial or injurious.

Catalogue of Canadian birds, III, J. Macoun (*Ottawa: Geol. Survey of Canada, 1904, pp. IV + 415–733 + XXIII*).—This part of the author's catalogue of Canadian birds completes the work at least for the present, and includes sparrows, swallows, vireos, warblers, wrens, titmice, and thrushes. Notes are given in considerable detail on each species regarding its relative numbers, distribution, habits, and economic relations. The total number of birds recorded for Canada includes nearly 800 species, in addition to a number of species of doubtful occurrence.

The protection of birds which are beneficial to agriculture, A. Meraz (*Bol. Sec. Fomento* [*Mexico*], *4 (1904), No. 4, pp. 356–377, pls. 4*).—The author briefly reviews the feeding habits and economic relations of a number of common birds in Mexico, including hawks, owls, meadow lark, robin, sparrow, etc.

Distribution and migration of North American warblers, W. W. Cooke (*U. S. Dept. Agr., Division of Biological Survey Bul. 18, pp. 142*).—In this bulletin the author presents a general account of the habits, distribution, and various routes of migration of North American warblers. Lists are given of the species of warblers which follow the different possible routes of migration, and notes are also presented on the southernmost extension of winter ranges of warblers. The major portion of the bulletin is occupied by the systematic report in which details are given of the

distribution and migration of all the species of warblers numbering 59, together with 19 subspecies which are discussed.

The yellowtail tomtit (Acanthiza chrysorrhoa), C. FRENCH (*Jour. Dept. Agr. Victoria, 2 (1904), No. 10, p. 1000, pl. 1*).—Brief notes are presented on the habits of this bird with especial reference to its efficiency as an insect destroyer.

Index-catalogue of medical and veterinary zoology, VII and VIII, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pp. 511-659*).—In these parts of the index-catalogue a list of authors is given whose names begin with G.

METEOROLOGY—CLIMATOLOGY.

Weather and crops in Europe in 1904 (*Jour. Bd. Agr. [London], 11 (1904), No. 8, pp. 479-485*).—A general review of weather conditions and crop production during the season of 1904, calling attention especially to the fact that "the central and southeastern countries of Europe suffered in a marked degree from drought and extreme heat, and the crops, particularly maize, roots, potatoes, late hay, and fodder crops, have in consequence been more or less injured, though it is probable that in the case of the cereal crops there may be some compensation in the improved quality of the grain."

Main results of agricultural-meteorological observations on the Poltava experiment field during the years 1886-1900, W. A. VLASOV (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 4, pp. 433-477*).—The author reviews (1) the yields for 15 years (1886-1900) on the Poltava experiment farm of winter rye, winter and summer wheat, oats, and barley, and (2) the meteorological conditions during the same years, and attempts to deduce some conclusions concerning the influence of the local meteorological conditions on the yield of the cereals mentioned.—P. FIREMAN.

Report of the meteorological work of the Ploti Agricultural Experiment Station, M. SVOLINSKY (*Godichnuĭ Otchet Ploty. Selsk. Khoz. Opuitn. Stantziĭ, 9 (1903), pp. 1-25, 121-124, charts 2*).—The usual observations on temperature of the air and the soil, atmospheric pressure, humidity, precipitation (including snowfall), evaporation, sunshine, solar radiation, wind movement, and miscellaneous phenomena are reported.

Meteorological summary for 1903, H. DUFOUR and D. VALET (*Chron. Agr. Canton Vaud, 17 (1904), No. 17, pp. 495-508*).—Observations at Lausanne, Switzerland, on temperature, precipitation, sunshine, and soil temperature are summarized for each month of the year and compared with averages for previous years.

Meteorology, P. BONÂME (*Rap. An. Sta. Agron. [Mauritius], 1903, pp. 1-9*).—Observations on atmospheric pressure, humidity, temperature, and rainfall are summarized for each month of the year. In case of rainfall summaries showing daily, monthly, and seasonal distribution are also given. The mean annual pressure was 736.7 mm. (28.73 in.), varying from 727.1 mm. (28.36 in.) January 29 to 742.8 mm. (28.97 in.) July 26. The average temperature was 21.4° C., the maximum 30.5° in March, the minimum 11° July 13 and September 9. The annual rainfall was 1,386.3 mm. (54.5 in.) as against 1,736.5 mm. (68.22 in.) in 1902. Of this amount 712.4 mm. (27.78 in.) fell during the night. Although the rainfall during 1903 was somewhat below normal, its distribution was very favorable for crops.

Forecasting the weather (*Nat. Geogr. Mag., 15 (1904), No. 7, pp. 285-292, figs. 7*).—This article gives some generalizations applying to the United States east of the Rocky Mountains, especially the Middle and Upper Mississippi and Ohio valleys, the lake region, and the Middle States, which it is believed will enable the local observer "to detect in the atmospheric changes, apparent to the eye or apprehended by the sense of feeling, the coming of an area of cloud and precipitation with its attendant whirling winds—warm on the front and right-hand side and cold in the rear and on the left-hand side."

The relation of weather to crop production, J. W. SMITH (*Jour. Columbus Hort. Soc., 19 (1904), No. 3, pp. 80–84*).—Mainly a summary of an article in the Yearbook of this Department for 1903 (E. S. R., 16, p. 136).

Weather influences, E. G. DEXTER (*New York: The Macmillan Company, 1904, pp. XXXI+286, figs. 52*).—This book discusses sources and nature of weather proverbs, the weather lore of the "skyey influences," animal weather lore, weather influences in literature, the empirical problem, the meteorological conditions, the child and the weather, crime and the weather, insanity and the weather, health and the weather, suicide and the weather, drunkenness and the weather, attention and the weather, and a summary of weather effects. A bibliography of the subject is included.

The humidity of the air of our homes, H. F. BISHOP (*Engineer. News, 52 (1904), No. 11, pp. 234–236, figs. 2*).—This question is somewhat fully discussed, the author stating in conclusion his belief "that a humidity of 30 to 50 per cent, depending upon outside conditions, can be readily maintained, will be found sufficient for comfort, and conducive to the best health."

A sensitive hygrometer, W. M. THORNTON (*Abs. in Nature [London], 71 (1904), No. 1828, p. 47*).—A paper read before the Physical Society, October 28, 1904.

"The instrument is made by enclosing the cooled surface of a Regnault's hygrometer in a glass globe, so that only the mass of vapor contained in the vessel is available for condensation. The cooled surface is made much smaller than usual—about 1 sq. cm. The surface-density of the deposited moisture depends on the total quantity of water vapor present. If this is more than a minimum to be determined later, it will be visible either by the loss of brightness by scattering, or by observing, as in the Dines hygrometer, the scattered light itself.

"Little is known as to the manner in which moisture is deposited on smooth, cold surfaces. Dr. Park has shown that the thickness of the deposit is of the same order as that of the black spot in interference films. The reflection of light from such a clear layer of uniform thickness backed by a bright surface is considered in the paper, and it is shown that the loss of light due to the thinnest possible films can be perceived. The opposite case to that of a smooth layer is that of clear spherical particles resting on the surface. This is also considered, and the surface-density to give a visible deposit is calculated. In connection with this an interesting note was received from Lord Rayleigh in reply to an inquiry, in which he shows that the maximum brightness of a cloud is about 4×10^{-5} that of the sun.

"Comparing all values, it is taken that 10^{-8} gm. per square centimeter can be detected by unaided vision with diffused light. The time taken for moisture to diffuse from a state of uniform distribution throughout the globe toward the center is then calculated, and found to be less than 10 minutes for a sphere of 20 cm. diameter. The paper is an attempt to make the somewhat neglected Regnault hygrometer an instrument of precision in the detection of small quantities of moisture."

Studies on the circulation of the atmospheres of the sun and of the earth, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bureau Doc. 316, pp. 44, figs. 24, charts 16*).—Reprints of articles previously noted (E. S. R., 15, p. 856; 16, pp. 25, 236, 237).

On the general circulation of the atmosphere in middle and high latitudes, W. N. SHAW (*U. S. Dept. Agr., Weather Bureau Doc. 314, pp. 13, figs. 4*).—This is a reprint of an article previously noted (E. S. R., 16, p. 237).

WATER—SOILS.

The progressive sinking of the ground water level and artificial ground water supplies, J. G. RICHERT (*Engineer. News, 52 (1904), No. 21, pp. 474, 475, figs. 7*).—The sinking of the ground water level as a result of excessive pumping is discussed, and the so-called Swedish system of raising the level and increasing the

ground water supply by means of artificial infiltration through cleansable basins is described.

Small fluctuations in mass of underground water, J. BOUSSINESQ (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 8, pp. 441–445; Rev. Sci. [Paris], 5. ser., 2 (1904), No. 10, p. 307*).

Underground streams and their utilization, L. DANGER (*Deut. Landw. Presse, 31 (1904), No. 81, pp. 689–691*).—A brief general discussion.

The Burt continuous water-softening process (*Engineer. News, 52 (1904), No. 11, p. 238, figs. 2*).—This system of treatment first with lime and then with soda is described.

The use of copper sulphate to prevent algal growths at Hanover, N. H., R. FLETCHER (*Engineer. News, 52 (1904), No. 17, p. 375*).—A successful trial of the method at the city water works is reported.

Report of the committee appointed to consider the standardization of methods for the bacterioscopic examination of water, R. BOYCE ET AL. (*Chem. News, 90 (1904), No. 2341, pp. 177–179*).—This is the report of a committee appointed at the Congress of the Royal Institute of Public Health, held at the University of Liverpool in July, 1903, "to consider the methods employed in the bacterioscopic analysis of water, and, if possible, to draw up a scheme of uniform procedure for adoption in such examination, and to report to the next congress of the Institute."

The committee names as the minimal number of procedures "(1) enumeration of the bacteria present on a medium incubated at room temperature (18 to 22° C.); (2) search for *Bacillus coli,* and identification and enumeration of this organism if present." While the committee regard these procedures as an irreducible minimum in the bacterioscopic analysis of water, the majority of the committee recommend in addition "(1) enumeration of the bacteria present on a medium incubated at blood heat (36 to 38° C.); (2) search for and enumeration of streptococci. The committee do not think it necessary as a routine measure to search for the *Bacillus enteritidis sporogenes,* but are agreed that in special or exceptional instances it may be advisable to look for this organism."

The report deals with methods of collection of sample; choice, preparation, and reaction of the media to be used; amounts to be plated, sizes of dishes, etc.; temperature of incubation; detection, isolation, identification, and characteristics of *Bacillus coli;* identification of streptococci and *Bacillus enteritidis sporogenes.*

Recent experiments and new problems in soil bacteriology, with especial reference to green manuring and fallows, L. HILTNER (*Arb. Deut. Landw. Gesell., 1904, No. 98, pp. 59–78*).—A review and general discussion.

Investigations in soil management, being three of six papers on the influence of soil management upon the water-soluble salts in soils and the yield of crops, F. H. KING (*Madison, Wis.: Published by author, with permission of Secretary of Agriculture, 1904, pp. VIII + 168, figs. 21*).—The three papers contained in this pamphlet are entitled, respectively, (E) Influence of farmyard manure upon yield and upon the water-soluble salts of soils, (F) The movement of water-soluble salts in soils, and (D) Absorption of water-soluble salts by different soil types. The other three papers of the series are: (B) Amounts of plant food readily recoverable from field soils by distilled water, (C) Relations of crop yields to amounts of water-soluble plant-food materials recovered from soils, and (G) Relations of differences of yield on eight soil types to difference of climatological environment. "The six papers constitute the report of the Chief of the Division of Soil Management [Bureau of Soils] for 1902 and 1903."

E—Influence of farmyard manure upon yield and upon the water-soluble salts of soils (pp. 1–61).—This paper gives the results of experiments with multiple proportions (5, 10, and 15 tons per acre) of barnyard manure and with guano (300 lbs. per acre) on 2-acre plats of 8 type soils located at Goldsboro, N. C. (Norfolk sandy loam and

Selma silt loam), Upper Marlboro, Md. (Norfolk sand and sassafras loam), Lancaster, Pa. (Hagerstown clay loam and Hagerstown loam), and Janesville, Wis. (Janesville loam and Miami loam). Soils were selected which were "strongly contrasted in their native productive capacities in order that strongly marked differences might be dealt with."

The crops grown were corn and potatoes. The yields of the crops, generally in both green and dry state, are recorded, as are studies of the water-soluble salts of the soils before and at intervals during the experiments. The plant juices were also studied with a view to ascertaining the relations between the soil solutions and the substances taken up by the crops. Care was taken to secure manure of uniform quality for use on the two soil types in each locality, but analyses of the manure are not given.

The results of the experiments with corn show in general that both relatively and absolutely the fertilizers had a greater effect on the poorer soils than on the stronger. With the poorer soils there was "a systematic difference in the yield of water-free shelled corn, closely related to the fertilizers applied to the soil. The group of four stronger soils did not show, throughout, this systematic relation." The experiments with potatoes yielded practically the same results as those with corn.

From the results of analyses of the leachings of the soils on which the experiments were made, "it is very clear that the effect of different amounts of stable manure applied to these soils . . . was such upon the recovery of the water-soluble salts as to enable the same treatment to remove different amounts from different fertilizations. . . . There is a clear quantitative relation, too, between the yields and the salts recovered, these (the former) increasing where the essential ingredients of plant food are higher." Four-pound samples of the soils mixed with comparatively large amounts of manure gave when leached after 65 days results agreeing in general with those obtained in the field tests.

The examinations of the plant juices showed that the manuring had a direct effect upon the water-soluble salts taken up by the plants. "It is thus shown that the crops on the manured ground recovered 29 per cent more potash from the four stronger soils, and 40 per cent more from the poorer soils, where the 15 tons of manure had been applied." On the other hand, lime and magnesia decreased where the potash increased.

Summarizing his results the author says: "The observations here presented, both upon the soils and upon the plants which had grown upon them, make it clear that when farmyard manure is applied to fields it has the effect not only of increasing the yields, but at the same time of increasing the amounts of water-soluble salts which can be recovered from the soils themselves and from the plants which have grown upon them."

F—The movement of water-soluble salts in soils (pp. 62–113).—The studies here reported were made on a number of type soils in galvanized-iron cylinders "provided with reservoirs at their bases which permitted the addition of water at the bottom of the columns and its rise by capillarity through the soil." The soils were removed at intervals in 2-in. sections and analyzed. The rise of capillary water increased the total soluble salts in the soils, the sulphates, nitrates, and chlorids accumulating in large amounts in the surface 2 in. The phosphates were not materially affected.

Field observations are cited to show the tendency of soluble salts to accumulate by "capillary sweeping" under rows of crops, especially in furrow irrigation and ridge culture.

In a series of experiments with the 8 type soils used in the experiments with manure noted above, a solution of salts was used in the reservoirs of the cylinders and their movement by capillarity studied.

"The solution was added to the reservoirs of the two cylinders of both pairs at the same time, as rapidly as capillarity would permit, until the soils became wet on the surface, the covers being kept on to prevent evaporation. At about this time the soil was removed from one of the cylinders in 1- or 2-in. layers, . . . weighed and dried and the per cent of moisture determined. The other cylinder of soil had its cover removed and was set out in a free circulation of air, to strengthen the loss of water by evaporation, and distilled water was kept supplied until about as much had been added to the soil as it had taken of the salt solution. There are thus two series of soil samples: (1) One through which a salt solution had risen by capillarity until the soil was wet on the surface, and (2) another in which distilled water was permitted to follow, also by capillarity, the salt solution until enough more had entered the soil to have about displaced the salt solution. . . . At the close of the period of capillary movement, in each case, the soil was removed in consecutive layers, the first four, 1 in. each, and the balance, 2 in. deep."

The results show that there was a general tendency "for the potash to concentrate at the bottom of the columns where the solution entered, while higher up in the soil capillarity had the effect of forcing the potash upward until it was arrested in the surface inch. . . . There was a remarkable difference between the amounts of lime and of potash recovered from the surface soil, the mean amounts for the 8 soil types being 1,468 for lime and 82.38 for potash or as 18 to 1; while in the bottom layer the mean amounts recovered were 34.41 of lime to 40.67 of potash, the relations being reversed. . . . The capillary movement reduced the lime which could be recovered from the bottom layer to about one-fourth and increased that at the top 12-fold; while with the potash the decrease was only about 6 to 7 per cent at the bottom and the increase at the top less than 2-fold. There is thus shown a strong difference between the movement of the potash and of the lime, through these soils under the influence of capillarity. . . .

"The movements of magnesia were, in general, more nearly analogous to those of the lime than to those of the potash, but there was no such large accumulations in the surface inch. . . .

"The tendency of nitrates to change one way or the other is so great, on account of biological influences, that the capillary movement of them can not well be indicated by such a series of observations, except in a most general way. . . . There was a heavy accumulation of the nitrates in the surface layer and a large reduction of them in the lower portions of the columns, which was undoubtedly due, to a great extent, to capillary movement.

"In the case of the phosphates, notwithstanding the addition of them to the soil with the solution, the absorption was so strong as to reduce the amounts which could be recovered to so narrow a margin that the movements can be measured by the methods only with great difficulty.

"The [results] show that, in the capillary movement of the sulphates upward through the soils, they advanced much as the lime and magnesia did, concentrating at the surface, but not as intensely as did either the chlorin or nitric acid. . . .

"No salt in the series investigated moved with such apparent freedom and abandoned the soil so completely as did the chlorids, or at least as did the chlorin.

"The most striking feature in the data presented in this series of observations is the completeness with which the chlorin disappeared from all but the surface inch of soil, in four of the types under treatment, even at the end of 20 days."

The results of experiments in small glass cylinders are reported which show that nitrates were rapidly concentrated in the upper layers of soil by capillary sweeping from below.

In experiments in cylinders to test the effect of earth mulches and bare fallow treatment on the capillary movement of soluble salts, the results indicated "a tendency of naked fallows to increase the water-soluble salt content of the soil, especially

if it was low to begin with, and the observed relations are in accord with the usual immediate increased productive power of naked-fallow fields, if it is true that an increase in the amounts of readily water-soluble salts in soils favor an increase of yield." The concentration of the soluble salts in the upper layers of the soils was more rapid in the unmulched than in the mulched soils, the concentration being especially rapid in case of nitrates, chlorids, and sulphates.

"In the case of the phosphates, silica, and bicarbonates, the distribution . . . was, in some respects, the reverse of what occurred with the nitrates, chlorids, and sulphates; with these, the amounts decreased with great rapidity through the first 3 in. and continued to decrease, only less rapidly to the bottom; with the phosphates and the other two radicles, there was but a small decrease, if any, through the first 3 in., but a well marked tendency for the amounts to increase with the depth."

The practical application of these results in soil management, especially as they bear on the value of cultivation to make water-soluble plant food materials more available and on the loss of plant food by surface drainage when the cultivation is such as to cause the soluble salts to accumulate at the immediate surface is discussed.

"Where the granular structure of the soil is feeble, as it is so often in the South, heavy rains, and even very moderate ones, so puddle the immediate surface that the water does not enter the soil readily but quickly flows to the lowest places, carrying with it the soluble salts which have been concentrated at the surface, and, if the fields are furrowed . . . much of the rainfall is liable to pass away in surface drainage and with it whatever of salts have been dissolved. Deeper plowing, which incorporates more of organic matter, and flat cultivation are two essential conditions which will very materially lessen these bad effects."

D—Absorption of water-soluble salts by different soil types (pp. 114–168).—Investigations made on this subject between 1845 and 1865 are reviewed, and the results of studies on the 8 type soils used in the investigations noted above are reported.

In these investigations a complex solution, containing potassium 25 parts per million, calcium 25, magnesium 10, nitric acid (NO_3) 40, phosphoric acid (HPO_4) 20, sulphuric acid (SO_4) 40, and chlorin 30 parts, was employed.

"In all cases the volume of the solution used was equal to five times the water-free weight of the samples treated and generally 600 cc. of solution and 120 gm. of soil were taken. Most of the observations were made with short periods of contact of the solution with the soil, this being made sometimes by shaking in bottles and sometimes by percolation. . . .

"The soils were examined for the amounts of water-soluble salts which could be recovered from them by washing 3 minutes in distilled water, and the amounts so recovered were added to the amounts which were added with the solution to the duplicate samples of soil treated, and the absorption was taken as the difference between the amounts remaining in the solution and those originally present, plus those shown to be present in the soil before treatment. Only colorimetric methods were used in determining the changes which occurred in the solution. . . .

"The treatment of the samples consisted in weighing into stoppered bottles 120 gm. of the dry soils and 4 gm. of carbon black, to decolorize the solutions. To each sample was then added 600 cc. of solution and vigorously shaken during 3 minutes; and then allowed to stand 24 hours, but shaken, during 3 minutes, 10 times during that interval."

The results show "that very strong differences may exist in the absorptive power of different soils and that, until the reverse is proven by careful observation to be true, we must expect to find that soils having a high absorbing power are capable, under favorable conditions, of giving larger yields than those having small absorbing power, and there can be no question regarding the desirability of carrying out suitable researches to establish what relation there may be between yields and the

absorptive power of soils for salts carried in solutions which are brought in contact with them."

In case of the Janesville loam "less phosphoric acid was recovered from each of the four depths than was recovered from the soil when washed in distilled water, while at the same time more silica was indicated by the method. If the reliability of the method is admitted, it follows that treating this soil with the salt solutions used resulted in fixing in the soil not only all the phosphoric acid added but a considerable per cent of that which could be recovered with distilled water in contact but 3 minutes; the lime, however, appears to have suffered but little change.

"Potash became fixed in increasing amounts with the depth and in each case the soil took on from 3 to 4 times the quantity recovered with distilled water; while of magnesia the amounts absorbed from the solution are in no case quite equal to those originally recovered with the distilled water.

"The absorption of SO_4 was large, and the results, in themselves, also indicate an absorption of nitric acid, although there is more reason to doubt these values on account of the large amounts of chlorin present which had to be removed before the determinations could be made, and on account of the possibility and even probability of denitrification having taken place. The chlorin, like the lime, remains practically unchanged."

With the Hagerstown loam "the results are in some ways very different from those just cited. In but one case was quite all the phosphoric acid removed from the solution, but the solution was a little stronger as used on this soil. Silica was more soluble in the salt solution than in distilled water, but not as much so as in the Janesville loam, except in the third and fourth feet.

"The lime behaved very differently, except in the fourth foot, very large amounts of it going into solution in the first and second feet, while in the fourth absorption occurred.

"The different depths absorbed the potash very unequally, the surface foot taking nearly double what the second took.

"In the case of the sulphuric acid, too, there is a strong contrast, very much larger amounts having been absorbed, except in the second foot, where a notable amount went into solution from the soil itself."

When the contact of the solution with this soil was increased to 72 hours instead of 24 the soil increased the amount of phosphoric acid absorbed, "adding to what they already had nearly 140 parts per million for all 4 ft.; but at the same time they appear to have lost from 8 to 37 parts of silica.

"Sulphuric acid, contrary to the observations of the earlier investigators cited, was absorbed in very large amounts by all 4 ft. at the end of 72 hours, although, at the end of 24 hours, the duplicate determinations on the second foot showed a solution from that soil of 44 and 42 parts per million.

"The large apparent absorption of nitric acid by the soil of the surface foot may be due to denitrification.

"The first, second, and third feet lost lime, as would be expected from earlier observations, until the end of twenty-four hours, and, except the third foot, to the end of 72 hours. The fourth foot, however, absorbed an increasing amount to the end.

"Both potash and magnesia were absorbed and the potash in larger amounts, as was to be expected; but after 24 hours the surface foot gave back to the solution again large amounts of both bases.

"While the indicated absorption of chlorin is small, compared with other things, we believe it is too large to be set aside as due to errors of method and irregularities in manipulation."

In experiments with a manure solution to which potassium nitrate was added, it was observed "that all soils absorbed large amounts of potash from the solution

used, but the Norfolk sandy soil least and less than one-eighth that absorbed by the Janesville loam, which produced the heaviest yields. While potash was absorbed by all soils, in every case lime went into solution, and in larger quantities from the four soils which gave the largest amounts of lime from treatment with distilled water. So, too, the four soils yielding largest amounts of magnesia, under repeated washing, gave this base over to the solution, but in three other cases magnesia was absorbed.

"Very large amounts of nitric acid failed to appear in the solution after contact with the soils, and it was clearly held back or transformed. Denitrification, in the biological sense, could not take place to this extent, (1) because the soils themselves were repeatedly dried at 120° C., and came to this experiment warm from the dry oven; (2) because sufficient time did not intervene for so much denitrification to have occurred as the result of vital activity. . . .

"More potash, in every case but one, was absorbed than was required to represent the chemical equivalent of the nitric acid disappearing from the solution. The retention of phosphoric acid was not very different with the different soils. . . . The solution contained phosphoric acid enough to represent 29.55 parts per million of the dry soil. In no case was this amount absorbed, and the amounts left in the solution ranged between 10 and 22 parts per million of the soil. . . . Comparatively large amounts of SO_4 were also fixed by the four poorer soils, the Janesville loam being the only one which corresponds with the observations of earlier investigators. Chlorin is the only negative radicle existing in the solution used which does not appear to have been fixed by the soils."

As regards the relation between yields and absorbed and dissolved salts in case of the manure solution it was observed that "when the four northern soils are compared, as a group, with the four southern soils, it is clear that much larger yields are associated with the power for larger absorption of potash and of total salts, and with the larger solution as well, where that has taken place. In the case of the individual members of the northern group, too, the yields and absorption of total salts rise and fall somewhat together. The Selma silt loam and the sassafras sandy loam, each of which is a stronger soil than its mate, have also a larger total absorption.

"If water-soluble salts carried by soils are important factors of yield, and if the absorbed salts are still recoverable by degrees under field conditions, and available to crops, some such relations as have been pointed out should be expected to exist between the more and the less fertile soils."

Studies were also made of absorption by these soils from a guano solution; by the same soils, washed 11 times with distilled water, from a prepared chemical solution; and of absorption by marsh soils.

The result of washing the soils "was the throwing out of solution much larger amounts of every ingredient present except phosphoric acid. The amount of phosphoric acid present in this solution, however, was only 12 parts per million more than in the one used in the guano series.

"Another remarkable relation brought out in this series is that the absorption of potash from this solution by the four northern soils averages nearly double what it does for the four southern soils, and yet for all other ingredients the southern soils have thrown out of solution more than the northern ones have, if we except sulphates, upon which they are practically equal in their effects."

In the experiments with marsh soils samples "were collected from a black marsh soil under three different crop conditions, (1) where corn was very poor, (2) where there was a fair average crop, and (3) where the corn had all died, possibly because the soil had been too wet, and was at the time supporting a rank growth of weeds.

"These soils were treated with two different solutions the usual time for washing soil samples, and by the same method, except that in these cases solutions instead of distilled water were employed. . . .

"The soil, under the good corn, yielded to distilled water most potash, most phosphoric acid, most chlorin, and most silica; while the soil under the poor corn yielded most lime, magnesia, nitric acid, and sulphuric acid; and the soil under no corn gave least potash, magnesia, and chlorin.

"Potash was absorbed from both the nitrate and chlorid in nearly the same amounts by the three conditions of soil, except that the 'no corn' soil took up 108 parts per million as the nitrate and only 80 parts from the chlorid, throwing out the same amount of chlorin in both cases and absorbing most nitric acid where it was combined with lime.

"Lime was thrown into solution by the soils under good and poor corn, where it went in as chlorid, but was absorbed as the nitrate; while the 'no corn' soil showed the reverse relation.

"Magnesia was absorbed in largest amount by the soil under good corn and in least amount by that under poor corn.

"Nitric acid was thrown into solution by the poor soil in both cases, but in largest amount when it went in with the lime. It was absorbed in much the largest amount from the potash salt by the good corn soil, but in least amount as the lime nitrate.

"The good corn soil absorbed more phosphoric acid than the poor corn soil in both cases and more than the 'no corn' soil in one case."

By increasing the time of contact from 20 minutes to 18 hours the tendency was to increase the absorption of potash, nitric acid, and phosphates, and to decrease that of lime and magnesia, sulphates, and chlorin.

Analysis of the soil by means of the plant (*Jour. Soc. Arts, 52 (1904), No. 2711, p. 881*).—This is an abstract of a paper by A. D. Hall, read before the British Association at its meeting at Cambridge. It briefly reviews previous investigations on the value of plant analysis as a means of ascertaining the fertilizer requirements of soils, especially the work of Atterberg on oats, and reports experiments by the author on oats grown in pots containing 6 soils of very different types.

Except in certain striking cases there was no strict agreement between results obtained by chemical analysis of the ash of the plants and of the soil. The variations in composition of crops grown in duplicate pots of the same soil were often greater than between those grown on different soils. The accumulated data of the Rothamsted experiments, so far as they bear upon this question, are summarized, and indicate in general that the composition of the plant does to a certain extent reflect that of the soil, yet the range of variation shown by the plant was less than that indicated by soil analysis.

The root crops are apparently very sensitive to lack of mineral plant foods in the soil, while the cereals are comparatively indifferent. It appears, for example, that "the analysis of the ash of the Swede plant would often provide a better indication of the phosphoric acid requirements of the soil than does the analysis of the soil itself, and that similarly the mangel plant will serve to test the state of the soil as to potash. A great number of data as to the limits of normal variation in the composition of the ash are, however, wanted before the method can be employed for practically testing the soil."

How can the farmer best determine the fertilizer requirements of his soil? GERLACH (*Arb. Deut. Landw. Gesell., 1904, No. 98, pp. 47–58*).—This article discusses the value of mechanical and chemical analysis, and fertilizer experiments for this purpose. Systematic and comprehensive field experiments are considered the most reliable means of determining the fertilizer requirements of soils.

Report of the chemical laboratory of the Ploti Agricultural Experiment Station, B. M. WELBEL (*Godichnuĭ Otchet Ploty. Selsk. Khoz. Opuitn. Stantziĭ, 9 (1903), pp. 95–120, 130–134*).—The studies of previous years (E. S. R., 15, p. 456) on the nitrogen content of the atmospheric precipitation and of drainage waters were continued during 1903. Studies were also made in vegetation boxes of the influence of manures

and fertilizers and of leguminous plants on the progress of nitrification in the soil, as well as the influence of different kinds of fallow and methods of cropping and fertilizing on the fertility of the soil.

In connection with the latter studies the relation between the phosphoric acid content of the plants and the assimilable phosphoric acid of the soil was investigated with results which lead to the conclusion that the amount of phosphoric acid taken up by plants is an index of the quantity available in the soil. Tests of various acid solvents (0.5, 1, and 2 per cent citric acid, 1 and 2 per cent nitric acid, and 2 per cent acetic acid) for this purpose have been undertaken.

On some soil bacteria and their importance in agriculture, J. Hohl (*Ann. Agr. Suisse, 5 (1904), No. 6, pp. 201–228*).—This is a summary of the more important results of the work of various investigators on this subject, with numerous references to literature.

Investigations in soil bacteriology and their practical importance, A. Koch (*Mitt. Oekon. Gesell. Sachsen, 1903–4, pp. 15–34*).—A general discussion of this subject.

FERTILIZERS.

The action of barnyard manure, W. Schneidewind et al. (*Ber. Versuchsw. Lauchstädt, 1904, p. 5; abs. in Chem. Ztg., 28 (1904), No. 67, Repert. No. 19, p. 230*).—Experiments on a rotation of beets, barley, potatoes, and wheat with deep-stall and yard manure are reported. The former was more effective than the latter in increasing the yield, but also reduced the sugar content of beets to a greater extent. The manures were more effective without addition of nitrate.

The preservation of barnyard manure, W. Schneidewind et al. (*Ber. Versuchsw. Lauchstädt, 1904, p. 26; abs. in Chem. Ztg., 28 (1904), No. 67, Repert. No. 19, p. 230*).—Comparative tests of gypsum, calcium carbonate, and Rippert's preparation (containing fluorin and sulphuric acid), the two former on loose and compact manure, are reported. None of the preparations except gypsum proved more effective than close packing of the manure.

On the question of manure preservation, W. Schneidewind (*Deut. Landw. Presse, 31 (1904), No. 73, pp. 625, 626*).—This article discusses briefly the nature, causes, and extent of losses which occur in manures handled in the usual way and treated with preservatives.

The safe handling and disinfection of fertilizers from slaughterhouses and cattle barns, R. Schmidt (*Arch. Wiss. u. Prakt. Thierh., 30 (1904), No. 6; abs. in Ztschr. Fleisch u. Milchhyg., 15 (1904), No. 2, p. 45*).—A compilation of information regarding various methods of treating disease-infected material.

Cotton-seed meal industry (*Amer. Fert., 21 (1904), No. 5, pp. 12–16*).—An account is given of the growth of the use of cotton-seed meal as a fertilizer and the methods of manipulating cotton seed in the factories are briefly described.

Experiments with lime nitrogen in comparison with nitrate and ammonia nitrogen, Wein et al. (*Chem. Ztg., 28 (1904), No. 79, p. 940*).—In a report presented to the section of agricultural chemistry and investigation of the German Society of Naturalists and Physicians, it was pointed out that lime nitrogen gives results very closely approaching those obtained with nitrate and ammonia nitrogen when the following precautions are observed:

(1) It should be applied about 14 days before planting in order that the germination of the seed may not be injuriously affected; (2) it should be used in moderate applications, not more than 3 kg. per morgen (about 11 lbs. of nitrogen (?) per acre); (3) it should not be applied as a top-dressing, since when so applied it may prove injurious to tender plants, and it should not be used on upland moor soils; (4) on lowland moor soils, especially on garden plants, it is fully as effective as ammonia nitrogen and nearly as effective as nitrate nitrogen.

Comparative experiments with nitrate of soda, sulphate of ammonia, and Krotnaurer's Blankenburger manure, W. SCHNEIDEWIND ET AL. (*Ber. Versuchsw. Lauchstädt, 1904, p. 52; abs. in Chem. Ztg., 28 (1904), No. 67, Repert. No. 19, p. 229*).—The Krotnaurer manure, which contained 5.77 per cent of nitrogen (mainly organic) and 5.85 per cent of phosphoric acid, was not as effective as the nitrate or sulphate, especially when used in the smaller amounts, on account of its slow action. It is best suited to light soils. These experiments also showed that there is danger of loss of nitrogen when sulphate of ammonia is used as a top-dressing on calcareous soils.

The action of different forms of nitrogen, especially ammonium salts and nitrates, on potatoes and oats (*Landw. Jahrb., 33 (1904), No. 3, pp. 335–342; Deut. Landw. Presse, 31 (1904), No. 63, pp. 547, 548; abs. in Chem. Centbl., 1904, II, p. 787*).—A series of vegetation experiments is reported from which the conclusions are drawn that ammonium salts produce higher yields of dry substance in potatoes than nitrate of soda, but that this is not true in case of beets. Apparently the latter crop utilizes to advantage the sodium of the nitrate.

In case of oats the nitrate produced somewhat more dry matter than ammonium salts. The crops produced a larger amount of dry substance for a given amount of nitrogen in ammonium salts than in nitrate. The production of dry matter per unit of nitrogen was still larger in case of organic nitrogen than in case of nitrogen in ammonia salts. No advantage was gained from divided applications of the nitrogenous fertilizers, nor was there any benefit from mixing the three forms of nitrogen.

The action of certain micro-organisms of the soil on ammonium sulphate and sodium nitrate, A. STUTZER and W. ROTHE (*Fühling's Landw. Ztg., 53 (1904), No. 17, pp. 629–635*).—Studies of the rate of conversion of nitrogen of nitrates and ammonium salts into albuminoid substances by various soil organisms in presence and absence of calcium carbonate are reported. Nitrogen of ammonium salts was more readily converted than that of nitrates. Except in case of *Penicillium glaucum*, lime did not increase the rate of conversion.

On the influence of liming upon the action of phosphatic manures, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 3, pp. 195–214, pls. 3*).—The object of the experiments here reported was to determine the cause of the detrimental effect which is often observed in connection with the liberal liming of paddy fields.

The experiments were made in wooden boxes somewhat less than a square meter in area, which were sunk about 60 cm. in the paddy fields. The soil used had been exhausted by continuous cropping without manure. It was a sandy loam of fine texture rather rich in humus (10 to 11 per cent) and contained 0.9 per cent of lime soluble in hot concentrated hydrochloric acid. Pure caustic lime in a state of fine powder was used at the rate of 400 kg. per hectare (356 lbs. per acre), being mixed with the soil to a depth of 1 ft. Double superphosphate was applied in connection with various nitrogenous fertilizers containing more or less phosphoric acid—fish scrap and bone, bone meal, rice bran, rape cake, sesame cake, and soy-bean cake. The observations on the direct (first year) and after effect (second year) of the liming are recorded.

The conclusions reached as a result of the two years' experiments are as follows: "(1) Lime exerts a retarding and unfavorable influence upon the availability of phosphoric acid of various organic manures. (2) This injurious action is about twice as powerful with animal manures as with manures of vegetable origin. (3) The action of organic matter as well as humus in manures diminishes the unfavorable effect of lime to a certain extent. (4) The retarding rate found for animal manures exceeds even that observed by Kellner and Böttcher with steamed bone meal and confirms, therefore, the claims of these authors. (5) The unfavorable effect of lime extends even to the second year as the return of yield over the loss of the preceding year was not satisfactory. (6) The relative manurial action of the phosphoric acid

compounds in the animal manures exceeds almost double that of the phosphoric acid compounds in the manures of vegetable origin in the first year. (7) In the second year the relative action of the vegetable manures increased to a certain extent, yet it still remained behind that of the animal manures."

On the action of various insoluble phosphates upon rice plants, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 3, pp. 215–261*).—The experiments here reported were made in wooden boxes somewhat less than 1 square meter in area and partially sunk in the soil. The phosphates used were double superphosphate (for comparison), ferric phosphate, ferrous phosphate, aluminum phosphate, and calcium phosphate. The soil used was taken from a paddy field which had been exhausted by 4 years' continuous culture of rice without manure. Each phosphate was used at three different rates, 25, 50, and 100 kg. per hectare (22.26, 44.53, and 89.07 lbs. per acre).

The experiments extended over 4 years and were divided into different series for the purpose of testing the relative direct effect of the phosphates and their after effects with and without the addition of lime. All of the phosphates showed considerable direct benefit both on the straw and on the grain of the rice, and this benefit increased with the increase in the amount of phosphate applied. In the study of the after effects of the phosphates it was found in all cases "that the unrecovered phosphoric acid had an influence to a certain extent on the second crop. However, there was no case in which the crops of the second year exceeded that of the first year. Further, the greater the amount of phosphoric acid left from the preceding year, the larger was the harvest."

The relative effect of the different phosphates in each of the 4 years of the experiment is shown in the following table:

Relative effect on rice of different phosphates during four years.

	First year.	Second year.	Third year.	Fourth year.
Double superphosphate	100	100	100	100
Ferric phosphate	140	141	309	58
Ferrous phosphate	87	88	194	44
Aluminum phosphate	92	145	514	112
Calcium phosphate	117	110	161	118

In the experiments in which lime was used it was shown that applications of caustic lime and calcium carbonate reduced the amount of phosphoric acid assimilated by plants, the former being much more active in this respect than the latter. This action of caustic lime is attributed in part to its neutralizing effect on acid humus and the acid secretions of plants. The assimilation of phosphoric acid by the plants during the second and subsequent years was greater on the limed soil than on the unlimed soils, but this increase was not sufficient to compensate for the decreased yield during the first year due to liming during the first year. Examinations of samples of the soil showed that the application of caustic lime had decreased the solubility of the phosphoric acid in neutral ammonium citrate and acetic acid. A similar but less pronounced result was brought about by the calcium carbonate.

In a supplementary note on these investigations O. Loew points out that the unsatisfactory action of the lime may be due in part at least to the fact that the ratio between the lime and magnesia in the soil experimented with was already that shown by Aso (E. S. R., 15, p. 1062) to be most favorable to the growth of rice, viz, 1:1.

On the effects of soil ignition upon the availability of phosphoric acid for rice culture in paddy fields, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 3, pp. 263–276, pls. 2*).—Experiments to determine the effect of igniting paddy soil for 15 minutes to faint redness, to remove the humus, on the availability of phosphoric acid are reported. The results show that the availability of the phos-

phoric acid was increased by ignition and destruction of the humus, with which the phosphoric acid was probably combined.

It was also observed that the application of alkaline substances, such as caustic lime and potassium carbonate, exerted an unfavorable influence on the assimilation of phosphoric acid, and this effect is attributed to the neutralization of the acid humus and the acid root secretions.

On organic compounds of phosphoric acid in the soil, K. Aso (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 3, pp. 277–284*).—With a view to ascertaining why soils yield more phosphoric acid soluble in hydrochloric acid after they are ignited than before ignition, the author made a chemical study of samples of raw soil and of soil which had been ignited, steamed for 3 hours under pressure in a sterilization apparatus, and steamed under pressure in 3 atmospheres in an autoclave for 3 hours.

He summarizes his results as follows: "(1) Phosphoric acid is present in humus soil in organic and inorganic forms. (2) The chief organic phosphoric compound is nuclein. Besides, a very small quantity of lecithin is present. Both compounds can be partially due to the bacterial flora of the soil, partially to the decaying plant roots. (3) The phosphoric acid in the organic compounds becomes available by burning the humus soil."

The after-effect of phosphates, H. Bachmann (*Fühling's Landw. Ztg., 53 (1904), No. 21, pp. 790–797*).—The results of a series of experiments on private farms to compare Thomas slag with 2 grades of so-called agricultural phosphate are reported.

The action of the individual elements of plant food (nitrogen, phosphoric acid, and potash) in the form of commercial fertilizers, W. Schneidewind et al. (*Ber. Versuchsw. Lauchstädt, 1904, p. 60; abs. in Chem. Ztg., 28 (1904), No. 67, Repert. No. 19, p. 230*).—The results of several years' experiments with various manures and fertilizer mixtures are summarized. The conclusions drawn are specific rather than of general application or interest. The utilization of soda by certain root crops, especially fodder beets and sugar beets, is discussed.

Dictionary of fertilizers and agricultural-chemical products, E. S. Bellenoux (*Dictionnaire des engrais et des produits chimiques agricoles. Paris: C. Reinwald, 1904, pp. XI+158*).—This is a series of brief articles, alphabetically arranged, on fertilizers and related topics intended for the use of the practical cultivator.

Analyses and valuations of commercial fertilizers, J. P. Street, W. P. Allen, and V. J. Carberry (*New Jersey Stas. Bul. 176, pp. 23*).—Analyses and valuations of 280 samples of fertilizers examined during 1904 are reported.

Report of analyses of commercial fertilizers for the spring of 1904, W. H. Jordan, L. L. Van Slyke, and W. H. Andrews (*New York State Sta. Bul. 253, pp. 269–317*).—The results of analyses of 371 different brands of fertilizers are reported. Of these, 275 were complete fertilizers in which the total nitrogen varied from 0.54 to 9.74 per cent, averaging 2.12 per cent; the water-soluble nitrogen from 0 to 9.62 per cent, averaging 1.01 per cent; the available phosphoric acid from 1.26 to 11.38 per cent, averaging 8.52 per cent; the potash from 0.16 to 10.74 per cent, averaging 4.77 per cent.

In 45 out of the 275 brands examined the potash was in the form of sulphate free from excess of chlorids. The average amounts of nitrogen, available phosphoric acid, and potash exceeded the guaranteed averages by 0.11 per cent, 0.96 per cent, and 0.27 per cent, respectively. The average retail selling price of the fertilizers was $27.56; the retail cost of the separate ingredients, unmixed, $19.85.

Analyses of commercial fertilizers, W. Frear (*Pennsylvania Dept. Agr. Bul. 126, pp. 139*).—This bulletin includes a review of the wholesale fertilizer market from September 1, 1903, to March 1, 1904, and analyses and valuations of 493 samples of fertilizers inspected during the spring of 1904.

Commercial fertilizers, H. J. Wheeler et al. (*Rhode Island Sta. Bul. 102, pp. 14*).—This bulletin contains analyses and valuations of 49 samples of commercial fer-

tilizers and 10 samples of wood ashes examined during 1904. Attention is called in the bulletin to the importance of insisting upon a guarantee of soluble phosphoric acid in fertilizers intended for use on acid soils.

Analysis of commercial fertilizers (*South Carolina Sta. Bul. 92, pp. 18*).—Analyses and valuations of 231 samples of fertilizers are reported, with notes on regulations governing the sale of fertilizers in the State, the taking of samples, etc.

Fertilizers, 1904, T. MACFARLANE (*Lab. Inland Rev. Dept., Canada, Bul. 97, pp. 35*).—The results of analyses and valuations of 111 samples of fertilizers examined under the provisions of the Dominion fertilizers act of 1890, and representing the fertilizers offered for sale in Canada in 1904, are reported with general notes on such subjects as care of nitrogen, treatment of barnyard manure, acquisition of nitrogen, utilization of sewage, and moss manure.

Analyses (water, ash, and nitrogen) of 24 samples of moss litter and peat are included. The value of this material as an absorbent and deodorizer for use in privies is pointed out, and it is claimed that "moss litter might also be applied with great advantage in public urinals. When a sample of it was supersaturated with urine and artificially dried, and this process repeated several times, no offensive odors were developed, and the product was found on analysis to contain 12.41 per cent of nitrogen, which is equal to a valuation of $32.26 per ton."

Mineral products of the United States, calendar years 1894 to 1903, D. T. DAY (*U. S. Geol. Survey, 1904, Sept., folio*).—The quantity and value of the different products during the years named are given. Among the products of special interest from an agricultural standpoint are phosphate rock, of which 1,581,576 long tons, worth $5,319,294, were produced in 1903; marl, 34,211 short tons, worth $22,521; and gypsum, 1,041,704 short tons, worth $3,792,943.

The Tennessee phosphate field, H. D. RUHM (*Amer. Fert., 21 (1904), No. 5, pp. 5–11, figs. 7*).—This is a brief account of the geology, location, and output of this field.

Potash minerals of Germany, F. H. MASON (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 289, pp. 104–108*).—This is a review of a treatise on the German potash industry recently issued by the German technical journal *Industrie*.

FIELD CROPS.

Experiments in electroculture in 1903, P. VAN BIERVLIET (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 6, pp. 241–253*).—A summary of the results obtained in England, Sweden, and Germany is given and the electrical installations used briefly described. Other articles upon this subject by the same author have been previously noted (E. S. R., 15, p. 248).

In experiments by Pringsheim, in Germany, the percentage increase in yield on plats under electrical influence was as follows: Strawberries 123 per cent, barley 32.5, potatoes 7.6, sugar beets 119.5, and garden beans 30.2. The soil conditions of the sugar beet plats were somewhat irregular. Carrots showed a reduction in yield, largely due to the fact that the plat was not watered.

In experiments conducted at Newcastle-upon-Tyne, an increase in yield is recorded in nearly every case for the plats provided with the electrical installation. Watering the plants proved beneficial in some instances and detrimental in others.

In the Swedish experiments the electrical influence apparently increased the yield of rye 19.5, of barley 40.1, and of oats 16 per cent. The plat of oats to which electricity was applied had imperfect drainage. The results with root crops show a small increase in yield for potatoes and sugar beets and a decrease for fodder beets and carrots, but unfavorable conditions interfered with this test.

Analyses which show that under the influence of electricity the sugar content of

beets was increased and the quality of cereals improved are discussed and the analytical data given in tables.

Experiments with agricultural plants, A. MITSCHERLICH (*Landw. Jahrb., 32 (1903), No. 5-6 pp. 773-818*).—The author discusses the subject from a theoretical and practical standpoint. The theoretical points discussed are the unreliability of one-year experiments, the correction of the results by applying the factor of the probability of error and the methods of its application; and the practical points are the choice of the experiment field, the planning and execution of the experiments, and the yields of the season. By way of illustration the proposed methods are applied to the results of a number of experiments.

Press drilling as a protection for winter grains, FALKE (*Deut. Landw. Presse, 31 (1904), No. 70, p. 601*).—A comparison between sowing winter wheat with the ordinary drill and the press drill is reported. Ordinary drilling yielded 2,025 kg. of grain, 3,153 kg. of straw, and 475 kg. of chaff per hectare as compared with 3,342 kg. of grain, 5,236 kg. of straw, and 728 kg. of chaff for the press-drilled plat. The number of plants and stems per meter of row, as well as the stooling capacity of the plants and the weight of the grain, and its content of nitrogen and ash, were also in favor of press drilling.

Field trials in 1903 (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 37-42*).—In several experiments with varieties of potatoes Evergood led in yield, with 9.7 tons per acre, being followed by Goodfellow with 8.4 tons. Charles Fidler, Schultz Lupitz, and Royal Kidney gave each an average yield of 6 tons per acre.

Four varieties of corn were drilled $3\frac{1}{2}$ in. deep in rows 18 in. apart on May 20 Three bu. of seed were used per acre. The yield of fodder per acre ranged from 16.5 tons to 25.5 tons. In addition to planting local commercial seed, Giant Caragua, Thoroughbred White Flint, and Wisconsin White Dent were grown. Wisconsin White Dent reached the greatest degree of maturity.

A number of Globe and Tankard varieties of mangels were grown from pedigreed and cheap seed. The high grade seed produced roots of good shape, uniform in size, and with small tops, while the low grade seed gave badly shaped roots with large tops. The average yield of 9 Globe varieties was 37 tons per acre, and that of 4 Tankard varieties, 30 tons.

Report of committee on coast experiments, J. S. NEWMAN (*South Carolina Sta. Bul. 91, pp. 22*).—This bulletin is a report of progress in experiments conducted at the experiment station at Hampton Park near Charleston. The crops under test are cotton, rice, teosinte, beggar weed, soy bean, Kafir corn, broom corn, peanuts, flax, tobacco, oats, and a number of other forage crops, together with asparagus, cantaloupes, and cucumbers. A fertilizer experiment with cotton on James Island, in which the nitrogen, potash, and phosphoric acid were applied in different combinations at the rate of 16, 30, and 42 lbs., respectively, showed that phosphoric acid was the most effective element on this soil.

Manurial experiments (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 103-110*).—Tests with barnyard manure and commercial fertilizers for hops have been in progress for 7 years. At the beginning of a 3-year rotation one plat received 30 loads of barnyard manure for the entire period, while a second plat received 10 loads each year. A third plat was annually given commercial fertilizers. In 1903 the plat receiving all the barnyard manure in one dressing yielded nearly half a cwt. more per acre than the plat receiving 10 loads each year, and the yields of both of these plats were considerably in advance of the yield obtained with commercial fertilizers alone.

The results of a fifth season in another experiment on the requirements of the hop plant as regards minerals, showed that the plants receiving potash gave the largest yields, and that neither a reduction of the application of basic slag from 10 and 15 cwt. to 5 cwt. per acre, nor the use of 10 cwt. of gypsum had any effect upon the

yield. The potash increased the vigor of the vine and delayed the ripening of the crop. At Farnham, where the fertilizer tests are in the fourth year and the soil is deficient in carbonate of lime, a marked beneficial effect on the yield of hops was obtained from the annual application of 1 ton of lime per acre.

Analyses of barley, J. MAHON (*Queensland Dept. Agr. Rpt. 1903–4, p. 25*).—Analyses of 5 samples of barley are reported, of which 2 were grown in Queensland. According to the author, the analyses show that the local-grown barleys compare favorably with Hungarian and English specimens, containing a little more starch and a little less proteid matter. In these respects they were said to be superior to California barley.

Variety tests with beets, VON SEELHORST (*Deut. Landw. Presse, 31 (1904), Nos. 47, pp. 421, 422; 48, pp. 428–430; 49, p. 435*).—The yields of a number of varieties of fodder beets grown from 1898–1903, inclusive, are reported. The White Eckendorf variety led in yield of beets. It was found that in general a high yield of beets was accompanied by a low leaf production and a low yield of beets by a high leaf production. The varieties which produced small yields of beets and high yields of leaves were richest in sugar. The highest percentage of sugar was shown by the Red Leutewitz variety. The dry matter and the sugar content of the different varieties show a marked degree of correlation so that within certain limits the one can be estimated from the other.

Six varieties of sugar beets were grown for 6 successive years, including 1903. Breustedt led in the average yield of beets with 38,250 kg. per hectare. In the average sugar production per hectare, Schreiber Imperial stood first with 6,303.4 kg. The extreme difference in the average yield of sugar per hectare between the varieties was 493.8 kg. The coefficient of purity which ranked from 84.02 to 86.34 was lowest in the varieties which led in yield of beets and sugar content and highest in the varieties rich in sugar but low in the yield of beets. The quantity of leaves produced seem more dependent upon the season than upon the variety. A comparison of the results for the 3 years shows that the sugar beets produced from 6,828 kg. to 7,405 kg. of sugar per hectare and the fodder beets from 6,715 to 7,092 kg.

Variety tests of fodder beets, F. WOHLTMANN ET AL. (*Illus. Landw. Ztg., 24 (1904), No. 86, pp. 989, 990*).—The yields of 33 of the principal German, English, and French varieties of fodder beets are reported and the experiments briefly described. The cylindrical-shaped varieties yielded the largest quantities of beets, the smallest quantity of leaves, and stood lowest in sugar content, while the varieties approximating the shape of the sugar beet gave the lowest yield of beets, a very high yield of leaves, and ranked first in sugar content.

The tankard varieties stood close to the cylindrical-shaped sorts in yield and composition, and the globe varieties produced very large yields of leaves and a medium quantity of beets of good quality. The long and horn-shaped sorts produced a relatively small yield of leaves and a medium yield of beets, with a sugar content ranging from satisfactory to high. The color of the beet showed no connection with its richness in sugar.

Experiments with nitrate of soda as a fertilizer for fodder beets, T. REMY (*Deut. Landw. Presse, 31 (1904), Nos. 58, pp. 507–509; 59, pp. 513–515*).—The results of 38 cooperative experiments are reported. All plats received a general application of barnyard manure, 1,100 kg. of kainit or a corresponding quantity of 40 per cent potash salt, 350 kg. of Thomas slag applied with the potash fertilizer, and 200 kg. of superphosphate per hectare, applied immediately before planting. In addition to this treatment some plats received 300 kg. of nitrate of soda at the time of planting, and others 300 kg. at the time of planting and an additional 300 kg. in June. The varieties grown were Cimbal Giant and Eckendorf Original.

The average results for all tests of both varieties show an increase in yield of 98.7 per cent on the plats receiving 300 kg. of nitrate of soda, and of 90.8 per cent on

those receiving 600 kg. The single application of nitrate of soda was profitable in 69.7 per cent of the number of tests, and the double application in 47.4 per cent. Cimbal Giant yielded on an average per hectare 61,800 kg. of beets and 20,200 kg. of leaves; and Eckendorf Original, 68,200 kg. of beets and 14,600 kg. of leaves.

The dry matter content of the beets was generally somewhat reduced by the use of nitrate of soda in these tests, but this reduction was not regular and the increase in yield more than compensated for the loss. It is concluded that the maximum application of nitrate of soda under the conditions of these experiments is about 300 kg. per hectare.

Broom corn suggestions, C. L. NEWMAN (*Arkansas Sta. Bul. 83, pp. 105–118*).—A popular bulletin on the culture, preparation, and marketing of broom corn. At the station where 3 crops have been grown the lowest yield of cleaned and cured brush, about one-sixth of a ton per acre, was obtained from California Golden, a dwarf variety, and the highest yield, about one-half a ton, from Tennessee Evergreen.

Fertilizers for flax, H. BLIN (*Jour. Agr. Prat., n. ser., 8 (1904), No. 39, pp. 401, 402*).—The fertilizer requirements of flax are discussed and the results of an experiment reported. Phosphatic and potassic fertilizers were found to be essential and to considerably increase the yield of fiber and grain, while nitrogenous fertilizers largely increased the total yield, but did not benefit the production of fiber in the same proportion, and caused a marked reduction in its quality.

Experiments upon the cultivation of hops at Goudhurst (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, p. 111*).—A plat having received no cultivation beyond keeping down the weeds for 9 years gave a higher yield than a plat cultivated deeply each year and one without cultivation for 3 years. The result is considered due to the smaller effect of a heavy rainfall on the hard uncultivated soil.

Experiments in breeding Székler maize, C. FRUWIRTH (*Fühling's Landw. Ztg., 53 (1904), No. 11, pp. 407–412*).—Breeding by selection was carried on from 1898 to 1902, inclusive. The objects of the work were to promote earliness and to obtain a better filling out of the ear, higher yields of grain, and a lower percentage of husks and cob.

An effort to breed plants producing only one ear was also made, but no definite success was obtained. Moist seasons seemed to favor the production of more than one ear per plant. Improvement in earliness was apparent, and the results in increasing the percentage and absolute yield of the grain were good, but the reduction in the percentage of husks and cob was unimportant.

Peanuts, C. L. NEWMAN (*Arkansas Sta. Bul. 84, pp. 117–129*).—A popular bulletin on the culture and uses of peanuts. The results obtained at some of the experiment stations with this crop are reviewed and the maximum yields at the station are recorded. The highest yield was obtained from Spanish peanuts at the Camden Branch Station, the yield being 143.5 bu. per acre, while the highest yields at Fayetteville were 113.6 bu. per acre for Virginia White and 109.09 bu. for the Spanish variety.

Selection of seed in potato growing, E. M. EAST (*Illinois Sta. Circ. 81, pp. 12*).—Directions are given for the selection of seed in potato culture, and the different points considered in this connection are type characteristics, size, shape, color, depth and number of eyes, tendency to second growth, and keeping quality. Figures on the value of the potato crop in Illinois are presented and the deterioration of varieties is discussed. The work on the improvement of the potato, by Girard, is reviewed.

On the behavior of the rice plant to nitrates and ammonium salts, M. NAGAOKA (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 3, pp. 285–334, pls. 6*).—Several series of pot experiments to determine whether nitric nitrogen is utilized by rice plants as well as nitrogen of ammonium salts are reported. The results indicate that the effect of sodium nitrate both as regards yield and assimilated nitrogen is

inferior to that of ammonium sulphate. The nitrogen of the latter was easily assimilated in proportion to the quantity applied. There was more or less residual effect during the second year from both the nitrate and the sulphate.

"It was sufficiently proved in all of the trials, that paddy plants can not utilize nitric nitrogen as well as ammoniacal nitrogen. The causes of this phenomenon may be: (1) Paddy plants do not accumulate a sufficient quantity of sugar in the leaves to convert all of the nitric acid absorbed into protein. The pale yellowish color of the rice plants supplied with nitrate is probably due to the physiological influence of accumulated nitrate. (2) In paddy soils, denitrification and also formation of poisonous nitrites may take place. Indeed, the pots of the series of experiments with heavy doses of the nitrate gave a slight Griess reaction for nitrite.

"In order to test my suppositions as to the denitrification a quantity of paddy soil with some sodium nitrate was kept in flasks well filled. Some nitrogen was gradually developed. As to the relative value of the nitric and ammoniacal nitrogen upon the paddy rice plant, Juncus, and arrowhead, it is seen that for 100 of the ammoniacal nitrogen, the nitric nitrogen had the following value: With paddy rice 40 (the result of the second series of experiments), with Juncus 37, with arrowhead 33. If the relative value for the paddy rice plant (40) is assumed to be 100, the value of the nitric nitrogen will be 90 for the Juncus and 80 for the arrowhead."

Native and introduced saltbushes, E. NELSON (*Wyoming Sta. Bul. 63, pp. 19, figs. 7*).—Experiments with saltbushes at the station, the results of a 3-years' test of Australian and native species, and observations made in the field are reported. The work was carried on in cooperation with this Department. The characteristics and distribution of saltbushes in general are given, and 7 of the more common species occurring in Wyoming are described.

The results of the different phases of the work indicated that the shrubby species are unsuited to cultivation, and that Nuttall and Nelson saltbushes, although of slow growth, make a good stand under favorable conditions and may be grown for pasturage. The native annual species, *Atriplex truncata*, *A. argentea*, and *A. philonitra*, are readily grown in moist alkali land and can be cut for hay. The best germination was obtained by weathering the seed and sowing the same on moist soil.

The results of different methods of planting were in favor of covering the seeds one-half inch deep; but nearly as good results were obtained by sowing without covering. Fall and very early spring proved to be the best time for sowing the seed. The culture of saltbushes is recommended on loose and friable soils moderately moist, and on moist alkali land not suited to other crops. The pasturage on alkali lands may be materially improved by simply sowing the seed, but with some cultural treatment greater success may be expected.

The growth of sugar cane, Z. KAMERLING (*Separate from Meded. Proefstat. Suikerriet West Java, 1904, No. 18, pp. 20, pl. 1*).—Measurements of the growth in height of sugar cane are recorded and discussed. The development of the cane is considered as apparent and actual growth. In the beginning of the growing period the apparent growth is greater than the actual growth, while toward the end of the period the reverse is the case. Directions are given for measuring the growth of cane, and the value of the measurements is pointed out.

A new method of planting and cultivating sugar cane (*Nuevo método de siembras y cultivos de la caña de azúcar. Havana: "La Prueba," 1904, pp. 91, pls. 15*).—A treatise on sugar-cane culture in Cuba.

Sugar beets, F. W. TRAPHAGEN (*Montana Sta. Bul. 52, pp. 55*).—This bulletin points out the requisites for the successful operation of beet-sugar factories, and gives general directions for the culture of sugar beets, together with data regarding the beet-sugar production and consumption of the United States and other countries. A number of factories and the territories from which they obtain their beets are

described. The results of tests with beets at the station and elsewhere are shown in tables.

The average weight of beets grown in cooperative tests was 1 lb. 8.5 oz. The sugar content of the beet was 11.87 per cent, the purity 74.2, and the yield 12½ tons per acre. An experiment in harvesting beets on 7 different dates from September 19 to October 30, inclusive, showed that in general the average percentage of sugar and of total solids, as well as the purity, increased as the beets were harvested later in the season.

A test of 6 different varieties at the station resulted in favor of Zehringen No. 3942, which produced beets averaging in weight 15.3 oz., and containing 16.2 per cent of sugar and 20.2 per cent of total solids, with a purity of 83.8. Results obtained in similar work in 1901 are presented for comparison. The results of 1903 are considered unsatisfactory.

Culture experiments with sugar beets, LANDRIN and LEGRAS (*Semaine Agr., 24 (1904), No. 1195, pp. 117, 118*).—Cooperative tests with varieties of beets of low and high sugar content are reported. The varieties low in sugar are really rich fodder beets, while the other varieties represent the common sugar beet.

The average tonnage of beets obtained was largely in favor of the varieties low in sugar, but the yields of sugar did not show very great differences between the 2 classes of varieties. The roots of the varieties low in sugar produced more dry matter, contained more water than the sugar beets, and were not so readily cut up into fine cossettes. The quantity of dry matter in the whole plant for the 2 kinds of beets did not vary much but was rather in favor of the richer varieties.

It is stated that the sugar beet retains less dry matter in the beet itself but contains more in the leaves than the fodder beet, and as the leaves remain on the field the sugar beet is considered as less exhaustive to the soil than the other. In these experiments the sugar beets contain 1.96 per cent of sugar per unit of the specific gravity of the juice, and the fodder beets 1.87 per cent. The varieties did not hold the same rank in sugar production in all of the tests.

Fertilizer experiments with tobacco, M. LEHMANN and S. TOBATA (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 443–472*).—The results of an extensive series of pot experiments with various fertilizer applications on different soils, conducted at the Nishigahara Experiment Station of Japan, are presented and discussed. In general, each pot contained from 30 to 37.5 kg. of soil, and the normal fertilizer application consisted of 1.07 gm. of nitrogen, 0.80 gm. of phosphoric acid, 1.61 gm. of potash, and 2.68 gm. of lime. The chemical and physical analyses of the soil samples are given in a table.

A heavy fertilizer application hastened the blossoming period, increased the quantity of leaves while it reduced the proportion of leaves to total yield, promoted the growth of the roots in the same ratio as it favored the growth of the entire plant, and somewhat reduced the burning quality; while a light fertilizer application lessened the yield, produced a relatively large quantity of leaves at the expense of the whole plant, and improved the burning quality. The moisture content of the leaves was but little if at all affected by the quantity of the fertilizer.

The plants receiving potassium nitrate were at first retarded in their growth, but after topping out they grew profusely and the yield of leaves and their burn was fairly good. The plants receiving rape cake grew very much like those receiving potassium nitrate, but were low in burning quality. Ash from either wood or straw proved to be a good fertilizer for tobacco. The water content of the leaves was increased to a certain extent by the use of soy-bean cake and nitrate of soda. Fish guano produced a good early growth, but after the plants were in blossom their further development was slow and the yield was reduced. The use of fish guano and soy-bean cake had no influence on the burning quality.

Perchlorate was given with nitrate of soda in quantities varying from 0.10 to 3 per

cent of the application. The larger quantity somewhat reduced the yield, but a small application of perchlorate was rather favorable inasmuch as it produced early blossoming and a more vigorous growth in the leaves and the roots.

The addition of a small quantity of sand to a heavy Nishigahara soil caused rapid growth and early blossoming and resulted in a good yield of leaf, with improved burning quality. On lighter soils the burning quality was still better, but the yield was very small. The use of clay instead of sand reduced the yield and the burning capacity. The early development of the plants seemed to be favored by a somewhat insufficient supply of moisture in the soil, but after blossoming the effect of this condition was detrimental. The plants receiving greater quantities of water gave higher yields. A low moisture supply seemed to affect the growth of the stem and the roots to a greater extent than it did the development of the leaves. The water content of the leaves increased with the quantity of water given.

HORTICULTURE.

Heredity in bean hybrids (Phaseolus vulgaris), R. A. EMERSON (*Nebraska Sta. Rpt. 1903, pp. 33–68*).—Statistical data are given showing the numerical relation between hybrids of different varieties of beans. A preliminary report on this subject was published two years ago (E. S. R., 14, p. 249). The present paper presents the results of the writer's work with bean hybrids in the light of Mendel's discoveries. The characters discussed relate to the habits of the plants, stringiness of pods, toughness of pods, color of pods, color of flowers, and color of seeds.

In regard to plant habit, the author found that one of the characteristic distinctions between bush beans and pole beans is that with pole beans the pod clusters are axial and continue to develop as long as the plants grow. With bush beans, on the other hand, many pod clusters are produced at about the same time on all of the usually numerous and short branches, after which the axes seem to elongate and make the pods appear as if borne terminally.

Pole beans and bush beans crossed with reference to the position of the pods give in the first-generation hybrids with axial pods. In second-generation hybrids plants with terminal and axial pods appeared, in the author's experiments, in the ratio of 2.75 : 1. Nine second-generation hybrids produced 130 plants in the third generation, all of which bore terminal pods. Of 19 plants exhibiting axial position of pods in the second generation 9 produced in the third generation 225 plants, all of which had axially disposed pods. Ten produced in the third generation plants showing both axial and terminal pods in the ratio of 3.6 : 1, which is somewhat in excess of the Mendelian expectation.

Some figures are given showing the results obtained as regards pod position in multiple hybrids. In the case of the second-generation multiple hybrids part of the plants behaved exactly like first-generation hybrids and part like second-generation hybrids, a phenomenon explainable according to the Mendelian principle of the purity of gamets with respect to unit characters.

Stringlessness in beans appeared to be a dominant character in some cases, while in other cases true intermediates occurred in the first generation. "In the majority of cases stringlessness has been dominant where the pistillate parent is stringless and intermediates have occurred where the pistillate parent is stringy. But this has not held in all cases." Where stringlessness was a dominant character in the first generation, only two forms, dominant and recessive, occurred in the second generation, the ratio being 65 dominant to 33 recessive, or practically 2:1. As between tough-podded and tender-podded races of beans, there was a strong tendency toward dominance of tenderness, the first-generation hybrids being almost as tender as the tender-podded parent.

Green color of pod proved a dominant and yellow a recessive character. As regards the color of flowers, dark-colored flowers were usually dominant when a cross was made between white-flowered and dark-flowered plants. As regards seed color, "the immediate results of crossing two races having different seed colors can not be foretold from any other hybrid between races with similarly colored seeds."

Statistical data covering the first, second, and third generation of hybrids is given for nearly all of the characteristics noted above, and comparisons made with the theoretical proportion as required by Mendel's law.

Shading vegetables (*Amer. Cult., 66 (1904), No. 47, p. 1*).—An account is given of 2 years' work in growing vegetables under tent shade at the Rhode Island station. During both years the growing season was cool. It was noticed that vegetables were more easily transplanted under the tent than outside. The tent covering also broke the force of rains, so that the ground was not packed so hard, nor did it bake so readily inside as outside.

Lettuce formed leaves faster inside the tent, but headed better and showed less tendency to run to seed outside. Celery matured more quickly outside than inside the tent, but the stalks were longer and the total amount of marketable celery considerably greater from the plants inside the tent. The quality also seemed to be a little better from the shaded ground.

Market gardening in Egypt, A. L. MONFRONT (*Alexandria Hort. Soc., 1904, pp. 13–36*).—Directions are given for the culture and fertilization of a large number of vegetables grown by market gardeners in Egypt.

Fall sowing and wintering of plants of the cabbage family, P. M. NÖVIK (*Norsk Havetidende, 20 (1904), No. 9, pp. 167–172*).—The article describes experiments by the author in sowing plants of the cabbage family in the fall and wintering the same under glass, so as to obtain early vegetables. In the author's experience a gain of 14 days to 4 or 5 weeks may be obtained by this method of procedure over that of spring sowing.—F. W. WOLL.

A soil experiment, E. A. SEASON (*Agr. Epitomist, 23 (1904), No. 9, p. 4*).—An account is given of growing cabbage on a piece of sandy land which had been devoted to the growth of root crops for a number of years, but was giving unsatisfactory results. A plat 155.5 by 93.33 ft. was left unmanured; another plat of the same size was fertilized with 200 lbs. acid phosphate and 40 lbs. of sulphate of potash, while a third plat received 200 lbs. of acid phosphate only.

The sudden appearance of winter early in the fall prevented the satisfactory harvesting and weighing of the crop, but it was noticed that the cabbage on the unfertilized plat grew tall and spindling, making but few heads, which were practically worthless. Satisfactory heads were grown on plats 2 and 3, but those on plat 2 were much more compact and solid and considerably exceeded in weight those grown upon plat 3, which received phosphoric acid only. Of the various forms of potash the sulphate is considered the best for cabbage.

Violet carrots, L. WITTMACK (*Festschrift zur Feier des siebzigsten Geburtstages des Herrn Professor Dr. Paul Ascherson. Leipzig: Borntraeger Bros., 1904, pp. 327–332, pl. 1*).—The author describes 2 violet colored carrots (*Daucus carota* var. *boissieri*) found in cultivation in Egypt and in Spain. The root of the variety from Spain is stated as being blood red like a beet and with a white heart. The root is long and grows half way out of the ground. It is considered especially valuable as a feed for horses, mules, and asses. A colored plate is given showing the form of the roots and details of the plants.

Native or Blackfellows' bread, D. MCALPINE (*Jour. Dept. Agr. Victoria, 2 (1904), No. 10, pp. 1012–1020, pls. 5*).—An account is given of this truffle-like fungus growth which is native to Victoria. Scientifically it is known as *Polyporus mylittæ*. A technical description is given of the plant, with numerous illustrations, and a bibliography of the literature of the subject. Specimens of this vegetable growth weigh-

ing 39 lbs. are noted. It is a subterranean fungus and is sometimes used by the natives for food.

No complete chemical examination was made, but it was found to contain about 78.68 per cent of water and 0.77 per cent of ash, which, though small in quantity, was rich in phosphates. The conclusions of the chemist who examined the material are to the effect that this native bread contains a small portion of pectous substances and has only a very small nutritive value. It does not contain nitrogen in any form and is practically unalterable in water or reagents. The bread is believed to consist mainly of a modification of cellulose, most probably fungin.

Horticultural section, W. J. PALMER (*New Zealand Dept. Agr. Rpt. 1904, pp. 105–108, fig. 1*).—A brief report is here given on the work of the horticultural section of the experiment station of the department. The author notes receiving a consignment of apples, pears, plums, peaches, and upwards of 50 varieties of gooseberries from America. They arrived in good condition, and the dry buds were at once inserted into growing stocks in order to obtain quickly plants for distribution. This method of treatment has been found equally as successful as when green buds were used, and it has been the means of saving imported varieties when only a small portion of vitality remains in the top of the plant.

The fruit industry of Steiermark (*Steiermarks Obstbau die Obstproduktion, der Obsthandel. Gratz: Steiermärkischen Landes-Ausschusse, 1904, pp. 67, pl. 1, figs. 54, map 1*).—This book gives an historical account of the development of fruit culture in Steiermark, the present status of the industry, the varieties of apples, pears, cherries, plums, apricots, and peaches most generally grown, with outline drawings of the most prominent sorts, and statistics of the industry extending over a number of years. Apples, pears, and plums, including prunes, constitute the chief fruits grown.

The graft union, F. A. WAUGH (*Massachusetts Sta. Tech. Bul. 2, pp. 16, figs. 10*).—The author has made a study of the nature of the union between stock and scion in hard-wood grafts. It appears that scion and stock do not unite like 2 parts of a broken bone, but remain totally distinct and separate. The new wood which forms after the graft is made is continuous and normally forms in annual unbroken layers like the layers of an ungrafted stem.

By sectioning a large number of grafts it was found that "in spite of the longitudinal continuity of the annual layers, there is sometimes, at right angles to them, a visible line of demarcation between the wood grown from the scion and that grown from the stock. The 2 kinds of tissue are sufficiently unlike that the difference can be noted with the naked eye. Moreover, in some cases there is a distinct line which seems to form a boundary between the 2 members."

The idea that new kinds of plants can be produced by the grafting of divers scions and stocks is held to be erroneous. "No matter how closely the two kinds of cells may lie against one another, their contents are never mingled in the production of a new cell. Each new cell is produced by the division of some older single cell, never by the fusion of 2 parent cells . . . The two kinds of tissue may commingle or lap in together somewhat along the line of junction, but this mixture is only mechanical, not physiological." The same kind of union and growth occurs in grafting by budding as in long-scion grafting.

The graft is not necessarily the weakest point in the limb. It has been observed that when the wind breaks off branches in an old orchard that a majority perhaps of the fractures do not occur where the grafts have been made, but elsewhere on the limb. In the case of defective unions caused by some incompatibility of scion and stock the graft is a source of weakness. Defective unions as a rule have not been found to be due to faulty technique in grafting, but rather to incompatibility of stock and scion.

"In the case of imperfect unions the continuity of the new growth is more or less interrupted by the deposition of a certain amount of loose scar tissue such as serves

in the healing of wounds. These conditions make the graft union mechanically weak. All degrees of mechanical strength may be observed in graft unions, ranging from those (a large number) which are stronger than the adjacent parts of the same stems down to such as are incapable of even holding themselves in place."

Budding fruit trees high above ground, H. M. STRINGFELLOW (*Texas Farm and Ranch, 23 (1904), No. 47, p. 11*).—The author presents the results of some observations on the reciprocal influence of stock and scion as relates to the peach.

In one instance a tree which had been budded about 18 in. above the ground with the Carman variety was allowed to send out a branch below the bud. As a result of this the branch from the stock developed luxuriantly while the branch from the Carman bud gradually failed and finally died. It has also been noted that where scions on budded stock have been planted deep enough to send out their own roots it has dwarfed or completely killed the roots of the stock. In order to secure long-lived budded trees, therefore, the author urges high budding on the stock. It is recommended that the buds be at least 12 or 15 in. above the surface, which would allow of reasonably deep planting without burying any part of the scion.

Varieties of fruits recommended for planting, W. H. RAGAN (*U. S. Dept. Agr., Farmers' Bul. 208, pp. 48, map 1*).—This bulletin has been compiled from the revised catalogue of fruits recommended for cultivation in the various parts of the United States and Canada by the American Pomological Society (E. S. R., 11, p. 544). The country is divided into 19 fruit districts. The varieties of orchard, garden, and small fruits and nuts, which are most likely to succeed in each of these districts, are mentioned under each of the different fruits and indication given as to their quality and preference.

The seedless apple 2,000 years old (*Amer. Agr., 74 (1904), No. 25, p. 556*).—A student under the direction of Prof. F. A. Waugh has investigated the history of the seedless apple and finds that it dates back at least 2,000 years. The earliest written account of this apple in America was in 1628. The variety was first described in 1868.

Honey peach group, F. C. REIMER (*Florida Sta. Bul. 73, pp. 135–153, figs. 4*).—An account is given of the introduction into this country and into Florida of the class of peaches known as the Honey group. Descriptions are given of the original Honey peach and of the 16 varieties which have developed from it.

The Honey peach group is characterized by distinct form and flavor, the flavor resembling that of honey from which the group derives its name. "In shape the fruit is distinct and varies slightly, generally being rounded, oblong, with a peculiar long conical apex which is more or less recurved." The stone may be either free or cling. The original Honey peach was introduced into this country from China in 1846, though it was not propagated commercially throughout the South until about 1858. It comes practically true from seed. The Honey variety is not now considered of importance commercially, being superseded by a number of its seedlings. The Honey group seems to be especially well adapted to the central and northern sections of Florida and also to southern Georgia, Alabama, Mississippi, Louisiana, and Texas. In Florida the peaches ripen at a season immediately following the Peen-to group. As a group these peaches can endure more cold than the Peen-to group and are, therefore, better adapted to northern Florida. The varieties Florida, Colon, Florida Gem, Imperial, and Triana are said to be favorite sorts in central and northern Florida, while in western Florida and the southern half of the Gulf States the varieties Colon, Climax, Florida Gem, Imperial, Pallas, Taber, and Triana are noted as favorites.

Citrus culture in Cape Colony, F. T. BIOLETTI, W. GOWIE, and P. J. CILLIE (*Agr. Jour. Cape Good Hope, 15 (1904), No. 4, pp. 413–431*).—This is a report of a commission appointed to inquire into the causes of the failure of citrus trees in Cape Colony. Visits were made to 16 of the more important citrus fruit-growing sections.

The instances in which orchards have failed entirely have been found to be due to the gum diseases, also known as mal-di-gomma or collar rot. Cases of partial failure occurred in a number of localities and were found to be due to a number of causes, including gum diseases, scale insects, insufficient or unsuitable methods of cultivation or irrigation, lack of fertilizers, use of bitter Seville as budding stock, and unsuitable soils and locations. In many instances a number of these causes were found operating. On the whole, however, except where gum disease was very prevalent, the orchards were found in fair to good condition, the cases of failure forming but a small portion of the whole.

A detailed account is given of the condition of the orchards in each of the districts visited and suggestions are offered as to the methods of combating the various diseases and insect pests, and the proper methods of propagation and irrigating. The basin system of irrigating without cultivation is believed to be wasteful of water and to spread and intensify gum disease.

Citronella and lemon grass in Ceylon, India, and the West Indies, J. C. SAWER (*Trop. Agr., 24 (1904), No. 4, pp. 223–225; Bul. Dept. Agr. Jamaica, 2 (1904), No. 10, pp. 224–231*).—A botanical account is given of the citronella and lemon grasses of these countries, with a list of the citronella estates in Ceylon. Statistics are given on the exports of citronella oils from Ceylon, the distribution of these oils, and of the shipment from Cochin of lemon-grass oil for the years 1891–1903.

Bananas in tropical America, E. W. PERRY (*West. Miner and Financier, 10 (1904), No. 30, pp. 4–12, figs. 6*).—In addition to information regarding the production, yield, and other topics connected with banana culture, the author gives a summary of data regarding dried bananas, banana flour, and other foods and feeding stuffs made from banana and plantain.

Cultivation of the mulberry, E. LÓPEZ (*Cultivo de la morera. Murcia: Estación Sericícola, 1904, pp. 23, figs. 3*).—A popular pamphlet on the culture of mulberries, including an account of the diseases and insects affecting them.

The breadfruit, H. E. BAUM (*Plant World, 6 (1903), Nos. 9, pp. 197–202; 10, pp. 225–231; 12, pp. 273–278, pls. 4*).—The history, botany, and uses of the breadfruit tree and related questions are discussed.

Strawberries the first season, W. BEEBE (*West Virginia Farm Rev., 12 (1904), No. 11, pp. 343, 344; abs. from Ohio Farmer*).—By planting strawberries in 3-in. pots the latter part of September or early in October, and sinking these pots in the ground up to the rim and covering with straw 8 in. deep after the ground had frozen 1 or 2 in. in depth, then transplanting early in the spring in rich soil, the author secured a splendid crop of strawberries the same spring, realizing $60 from 1,000 plants.

Strawberries from seed, HELEN MANNING (*Agr. Epitomist, 23 (1904), No. 6, p. 19*).—In originating new varieties of strawberries from seed, the fruit is left on the plant until dead ripe and almost ready to rot. It is then picked and the seeds scraped from the outside of the berry so as to get as little pulp as possible. The seed is washed and mixed with several times its bulk of sand. It is then placed in a thin muslin bag and kept between two cakes of ice for several days. "This provides the touch of winter, without which the seed does not germinate well."

Result of some experiments, G. C. STARCHER (*West Virginia Farm Rev., 12 (1904), No. 11, pp. 342, 343; abs. from Weston Democrat*).—By the use of nitrate of soda along the rows, the author secured a good crop of raspberries on thin yellow clay soil on which corn was practically a failure.

Viticultural division, R. BRAGATO (*New Zealand Dept. Agr. Rpt. 1904, pp. 235–246, pls. 2*).—An account is given of the work of the viticultural division in analyzing wines, on the presence of fungus diseases during the season, and on the general condition of the vineyards. Tabulated data are given showing the chemical composition of 46 samples of wines.

Specific variations due to crossing, A. JEANNIN (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 49, pp. 656-661, figs. 17*).—A study was made of variations in grapes which might be attributed to crossing. The study included the examination of the normal leaves, the vines, and a microscopical study of various sections of the leaves and stems. Many illustrations are given, but no conclusion that the crossing causes specific variation is reached.

A curious case of asexual hybridization, M. ROCHER (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 46, pp. 567, 568*).—An example was cited in which a Riparia stock which had been grafted with the variety Aramon sent out a shoot which produced 2 bunches of grapes. These bunches were much larger and the berries were much larger than the normal fruit of Riparia, and resembled in appearance the Aramon variety. While some recent writers would consider this result due to the influence of grafting with the Aramon variety, the author holds it due simply to ordinary variation.

FORESTRY.

Forestry for farmers of Connecticut (*Connecticut State Sta. Forestry Pub. 1, pp. 4*).—According to this bulletin the proportion of improved land in the State has decreased since 1850 from 74.2 to 46 per cent. While the decrease in improved land is attended with more intensive farming, the author believes that the unimproved lands should be utilized to better advantage. Forestry plantings on such lands are said to be remunerative, and very little of the wooded area of the State is said to yield as great returns as it is capable of under proper management.

Most of the woodlands of the State have been cut over at least once, and many of them two or three times, so that there is comparatively little mature forest at the present time. In order to utilize the present forest and to extend it as much as possible, arrangements have been made to bring about a better management of unimproved lands of the State through the forester, who will give expert advice on all subjects pertaining to forestry. The conditions under which expert information will be given are stated, and the owners of unimproved lands are urged to cooperate with the forest department of the station.

Forest planting in western Kansas, R. S. KELLOGG (*U. S. Dept. Agr., Bureau of Forestry Bul. 52, pp. 52, pls. 7, map 1*).—The investigations upon which this report is based were made for the purpose of determining the kinds of forest trees best adapted to western Kansas, and the methods of treatment which have proved most successful. The region covered embraces that portion of Kansas west of the ninety-ninth meridian, and also includes portions of Nebraska, Oklahoma, and eastern Colorado.

Notes are given on the physical features and climate of the region, together with a discussion of the effect of forests on climate, use of shelter belts and wind-breaks, and the planting of wood lots. Details are given of a number of artificial plantations, of which the cost of planting, cultivation, and growth are shown. For the region covered, the species recommended for different uses are as follows: Upland planting—honey locust, Russian mulberry, Osage orange, and red cedar, with white elm, green ash, hackberry, Scotch pine, and Austrian pine as promising. In river valleys all of the above species do well, and in addition may be added cottonwood, silver maple, box elder, black walnut, and hardy catalpa.

For hedges the author recommends honey locust, Osage orange, and Russian mulberry, while for commercial planting, where posts and other timbers are desired, Osage orange, black locust, Russian mulberry, and hardy catalpa will give the best results. For street and roadway planting the best trees are the honey locust, green ash, white elm, and hackberry. Planting plans for a number of regions are suggested and notes and measurements given on a number of plantations.

The author summarizes the bulletin, stating that while the effect of forest planting on the climate is problematical, yet it does have a decidedly favorable influence on the conservation of moisture and checking of winds. Where planting is intended there should be an intelligent selection of species, followed by proper planting, thorough cultivation, and a definite understanding as to whether the planting should be for shelter belts, ornamental, or commercial purposes. In all, about 26 species of trees are discussed.

Report of committee on forestry, 1902, J. T. ROTHROCK (*Pennsylvania Dept. Agr. Rpt. 1903, pp. 244–251*).—According to this report the State of Pennsylvania is now in possession of over 360,000 acres of forest land and negotiations are in progress for 200,000 acres additional. The average price of the land has been about $1.90 per acre.

The location of the forest reservations, the character of the timber, etc., are described. A nursery of 5 acres has been established in connection with one of the reservations, and at present it is devoted mainly to the production of white pine seedlings. It is intended to introduce red pine and various hard woods in connection with other species. Attention is again called to an act of the legislature to encourage the preservation of forests by providing for a rebate of taxes levied thereon, and the attention of the proper officers is called to this law, which does not seem to have been properly enforced.

Attention is called to the value of wind-breaks about farm buildings, and the relative value of different species of trees for planting for this purpose is pointed out.

The chestnut in southern Maryland, R. ZON (*U. S. Dept. Agr., Bureau of Forestry Bul. 53, pp. 31, pls. 5*).—The value and growth of the chestnut as observed in the studies made in portions of southern Maryland are shown, the data being drawn from measurements of several thousand chestnut trees of different ages and conditions of growth.

The area examined lies within the coastal plain region of the State and is composed of unconsolidated clays, sands, and gravels which are easily eroded, and as a result the surface of the country is hilly and rolling, washed into deep, narrow valleys by the small streams. The original stands of timber are mostly gone, and the data presented are based largely on second-growth timber. The different forest types and the sylvicultural characteristics of the chestnut are described at length.

From the conditions observed it is concluded that the chestnut is best suited to pure coppice growth, and its capacity in this respect is quite marked. The capacity of chestnut to produce sprouts from the stump will not save the forest from deterioration unless efforts are made to provide for natural reproduction from seed. Owing to various causes, reproduction from seed is slow and less frequent than where sprouted from stumps, but as the chestnut is not suited to the production of large timber its utilization as coppice is to be preferred.

The chestnut should be cut either in the winter or early spring, as this secures a better reproduction from the stump and the timber itself will be of better quality and greater durability. The tree should be cut as near the ground as possible, and when 20 in. or more in diameter should be sawed, not hewed, into ties, and when less than 11 in. should not be cut for ties on account of the great amount of waste.

Administration report of the forest department in the Bombay Presidency including Sind, G. P. MILLETT, T. B. FRY, ET AL. (*Forest Dept., Bombay Presidency, India, Rpt. 1902–3, pp. 206, dgm. 1*).—The administration reports for the northern, central, southern, and Sind forest circles for the year 1902–3 are given, in which the various changes in the reserved and protected forests are shown. The cost of operation and the results of the various investigations are stated.

The culture and regeneration of spruce in Belgium, A. DOUDLET (*Ing. Agr. Gembloux, 14 (1904), No. 12, pp. 559–583*).—A discussion is given of the spruce (*Picea*

excelsa) as a forest tree adapted to various situations. Particular attention is paid to its culture, illustrations being drawn from the results obtained in Germany, Switzerland, etc.

In the second part of the paper attention is called to the exploitation of spruce forests, and the author concludes that this species of tree is adapted to certain parts of Belgium, if attention be given to some of its peculiarities, such as protection from winds, etc. Growth from natural seeding is said to be much slower and less certain than where artificial plantations are made. All things considered, a 70 to 80 year rotation when planted in pure forests is recommended, and the different methods of thinning, cutting, etc., to be adopted are described.

There are some advantages found in growing spruce with mixtures. For this purpose beech is a valuable species, but the treatment should be such as to secure spruce as the dominant species. If the soil is not adapted to beech, groups of fir can be distributed throughout the plantation to advantage, but, if possible, the fir should be started a few years in advance of the planting of the spruce.

The Sihlwald, A. POSKIN (*Ing. Agr. Gembloux, 14 (1904), No. 12, pp. 600–616*).—An account is given of the communal forest of Zurich, Switzerland, and the methods of exploitation, clearing, forest industries, administration, etc., are described.

Sylviculture and arboriculture in ancient Rome, E. CHARDOME (*Ing. Agr. Gembloux, 14 (1904), No. 12, pp. 591–599*).—A review is given of an ancient practice in sylviculture and arboriculture, and the methods employed, so far as they went, are said to be quite similar to those in vogue at the present time.

The value of seed trees, L. C. MILLER (*Water and Forest, 4 (1904), No. 3, p. 9, fig. 1*).—The necessity of seed trees for natural reproduction is pointed out, and in California the author recommends that at least one or two well-developed, vigorous seed trees to each acre of cut-over land be left standing. These trees should be carefully selected and frequently trees of little value for lumber may be otherwise satisfactory as seed trees.

The main uses of wood, W. R. LAZENBY (*Jour. Columbus Hort. Soc., 19 (1904), No. 3, pp. 84–98*).—The principal demands for wood are mentioned, the author dividing them into a number of categories, each of which is considered. The value of different kinds of timber produced in Ohio for the different purposes is discussed.

DISEASES OF PLANTS.

Quantitative estimation of disease spores, N. A. COBB (*Agr. Gaz. New South Wales, 15 (1904), No. 7, pp. 670–680, figs. 7*).—Following up the suggestion of H. L. Bolley of the North Dakota Station (E. S. R., 14, p. 983), the author reports on the use of the centrifuge as a means of recognizing the occurrence and estimating the abundance of spores of smut in samples of grain. Directions are given for the preparation of samples and the results of a number of examinations are given.

The author describes methods for counting spores under the microscope, and comments upon the accuracy of the test. Where a centrifuge is not available similar results may be obtained by attaching a test tube to a wire which is rapidly whirled about a wire nail or other support. The use of the centrifuge will ensure the detection of smut in seed grain that would otherwise escape discovery.

North American Ustilagineæ, G. P. CLINTON (*Proc. Boston Soc. Nat. Hist., 31, No. 9, pp. 329–529*).—The comprehensive monograph here presented is largely a result of studies made by the author in the cryptogamic laboratory of Harvard University, but had its inception in earlier studies on the economic species carried on in Illinois, the results of which have been published in Bulletins 47 and 57 of the Illinois Station (E. S. R., 9, p. 145; 12, p. 355).

The author recognizes 18 genera and enumerates slightly more than 200 species. The specific descriptions are based on the writer's examination of available material,

and in many cases this has resulted in a broader description than the original, which was based on a single type specimen.

After enumerating and describing the species, a list is given of the host plants, with their different parasites, the distribution of the species is indicated, and an extensive list is given of references to the more important articles relating to the Ustilagineæ. This bibliography embraces more than 200 titles.

A corn mold, J. L. SHELDON (*Nebraska Sta. Rpt. 1903, pp. 23–32, fig. 1*).—The author's attention was called in 1900–1 to a reported injury to cattle from eating moldy corn. A number of specimens of moldy corn were examined, and a reddish mold seemed to be present on all samples. This was isolated and cultivated and proved to be a species of Fusarium, the characters of which are described. So far as the author has been able to determine it is an undescribed species, and the name *F. moniliforme* is given it. The relation of this fungus to a disease of animals is discussed elsewhere (E. S. R., 16, p. 606).

Notes on the wheat stem disease (Ophiobolus herpotrichus), C. J. J. VAN HALL (*Tijdschr. Plantenziekten, 9 (1903), pp. 77–110*).—The disease of the wheat stem caused by the attack of Ophiobolus occasioned much loss in the Netherlands during 1902. It is thought to be communicated by the mycelium of the fungus living in the soil. It causes the lower portion of the stems to turn brown and weaken, resulting in the lodging of the wheat about blossoming time.

At the time of the severe attack of 1902, circular letters were sent to some 200 correspondents asking for information regarding the appearance of the disease, the history of fields in which the grain was attacked and of such fields as remained free from injury.

From the answers received the writer draws the following conclusions:

Wheat should not follow wheat or barley oftener than once in three or preferably four years. The best sowing date is early in November and certainly not earlier than the latter half of October, since early sown grain is more liable to the disease. Wheat following a leguminous crop is especially liable to the disease. Red thick-headed wheat appears to be more resistant than other sorts. Exchange of seed is beneficial. A too rank growth due to nitrogenous fertilizers is dangerous. There is no advantage in unusually deep plowing—the usual depth is quite as good.—H. M. PIETERS.

Diseases of cereals, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 40, pp. 371–374, pl. 1*).—The occurrence of rusts, smuts, bunt, ergot, etc., on cereals and the injury done by them are described, and suggestions are offered for their prevention. The author describes the methods of treatment of seed grain with copper sulphate, hot water, and formalin for smut prevention, and where the copper sulphate solution is used he recommends treating the seed with powdered lime after the preliminary soaking. The lime facilitates drying, prevents continued injury by the fungicide, and acts in a favorable manner toward the young plants.

Farm treatment for ergotized rye, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 8 (1904), No. 33, pp. 202, 203*).—An account is given of a method suggested by Müller and Nobbe for the removal of ergotized rye from seed. This is based on the different specific gravity of the sound and diseased grain. In order to separate the ergotized grain a solution of 16 kg. of potassium salt containing 37 per cent potash is made in 100 liters of water. The seed is placed in this, stirred thoroughly, and the diseased grains being lighter rise and are skimmed from the surface. After thoroughly stirring and removing the diseased rye, the remainder is removed, washed, and dried as rapidly as possible, after which it may be seeded.

It is said that hot summers with prolonged periods of sunlight tend to the production of ergot, particularly in Sweden, and the past summer having been of this character it is thought desirable to advise cultivators of this method of obtaining clean seed.

The researches of H. Marshall Ward on the brown rust on the bromes and the mycoplasm hypothesis, J. Eriksson (*Ark. Bot., 1 (1903), No. 1-3, pp. 139-146*).—The author reviews and criticises the investigations of Marshall Ward on the rusts of brome grasses which have been published within the last few years.

He differs with Marshall Ward in the interpretation of some of the results given and defends the hypothesis, which is now referred to as the mycoplasm hypothesis, claiming that in addition to the 2 forms of infection by uredospores and æcidiospores we must recognize a direct infection by teleutospores without the intervention of an æcidial stage or from a latent germ of disease inherited from the parent plant, concealed in the seed sown, or in the case of perennial species in the stolons growing forth in the spring. Both of these methods of infection presuppose a period of incubation of from 2 to 10 months.

A soft rot of the sugar beet, H. Metcalf (*Nebraska Sta. Rpt. 1903, pp. 69-112, figs. 6*).—An extended account is given of a soft rot of the sugar beet which the author, together with G. G. Hedgcock of this Department, has previously noted (E. S. R., 14, p. 1085). The disease is due to bacteria, the general characters of the disease being described and its distribution noted.

An account is given of inoculation experiments on sugar beets and other vegetables, it being readily demonstrated that the disease is produced by the organism. In addition to sugar beets the bacterium made a slow growth on garden beets and a slight growth on carrots and sweet potatoes, but did not spread much from the point of inoculation. Onions, hyacinth bulbs, and parsnips, inoculated in December, 1901, gave no infection, but when the experiments were repeated the following spring the rot spread to a slight extent. On potatoes, turnips, radishes, tomatoes, and apples no growth occurred.

The cause of the disease is attributed to *Bacterium teutlium*, and the morphological and general characters, as well as its cultural characters, are described at length. So far as the author's investigations are reported there has not been sufficient field work to demonstrate the general distribution of the disease, but it is believed that it may prove quite serious in restricted localities. In order to prevent the disease the author recommends growing beets on relatively dry ground, and the roots should be well dried and sunned before put in storage. If these precautions are followed there will probably be little loss due to this cause.

Blackleg or potato stem rot (*Bd. Agr. and Fisheries [London], Leaflet 117, pp. 3, figs. 2*).—An account is given of a disease of potatoes caused by *Bacillus phytophthorus*, a previous account of which has been given (E. S. R., 15, p. 374). There is said to be reason to believe that the disease is spreading in Europe, frequently causing 10 to 15 per cent loss, and sometimes as much as 75 per cent of the entire crop is destroyed. The suggestions for the control of the disease are rotation of crops, planting of whole tubers, care in obtaining seed tubers from uninfested regions, and the avoidance of the use of lime or strong nitrogenous manures.

Club root of cabbage, H. Vanderyst (*Bul. Agr. [Brussels], 20 (1904), No. 4, pp. 533-567, figs. 9*).—An investigation was conducted by the department of agriculture on the occurrence and distribution of the club root of cabbage, due to *Plasmodiophora brassicæ*. In carrying out this investigation letters were addressed to a large number of horticulturists, agriculturists, cultivators, and others, asking for information regarding the distribution of this disease, the influence of various factors on its development, etc.

From the replies obtained the article is compiled and it is shown that the disease is well distributed throughout the agricultural portion of Belgium. There seems to be a very evident relationship between the frequence of occurrence and destructiveness of the disease, and the chemical composition of the soil and method of cultivation. It has been known from time immemorial in the sandy soils of Flanders and

Brabant, while in the calcareous soils of other regions the disease seems to have made its appearance only in recent years.

A list is given of the various plants on which the fungus lives, the author having compiled information from various sources. In Belgium it is found that in addition to cabbage, ruta-bagas, turnips, kohl-rabi, and radishes, the fungus attacks field and cultivated mustard, shepherd's purse, *Iberis umbellata*, and *Cheiranthus cheiri*.

Report on vegetable pathology, H. Tryon (*Queensland Dept. Agr. Rpt. 1904, pp. 69, 70*).—Brief notes are given on a number of diseases of fruits, vegetables, coffee, cotton, tobacco, wheat, etc., that have been reported during the past year, and some of the species of fungi are under investigation.

The apple scab in western Washington, W. H. Lawrence (*Washington Sta. Bul. 64, pp. 24, pls. 2, figs. 5*).—The apple scab, which is widely distributed throughout the United States, being particularly abundant along the Atlantic Coast and Middle Atlantic States, has become abundant and destructive in western Washington.

A description is given of the life history of the fungus, its 2 stages being described at considerable length. The summer stage, which is the form most widely known, has been referred to *Fusicladium dendriticum*, and the resting stage has been recently described as the fungus *Venturia inæqualis*. The different phases of the fungus and its effect upon the host plant are described, and notes given on the susceptibility of different varieties of apples to disease.

Spraying experiments have been conducted for several years at the Puyallup Substation for the control of this disease, and have shown that thorough spraying with Bordeaux mixture reduces the percentage of scabby apples to a very great extent. These experiments have been repeated on a number of varieties and have given similar results. Directions are given for the preparation and application of Bordeaux mixture. Experiments with potassium sulphite have been without benefit, and ammoniacal copper carbonate and a sal-soda copper-sulphate solution have both proved less efficient than the plain Bordeaux mixture.

Anthracnose of the pomelo, H. H. Hume (*Florida Sta. Bul. 74, pp. 159–172, figs. 4*).—Attention was called to this disease in a previous publication (E. S. R., 12, p. 463) where the disease was described as a leaf spot. During the season of 1903–4 a new disease appeared on the pomelo fruit in a number of sections of the State, and careful examinations showed that it was caused by the fungus *Colletotrichum glœosporioides*, the cause of the leaf spot.

The effect of the fungus on the leaves, twigs, and fruit is described at length. The conditions favoring the disease are said to be a starved condition of the trees, the action of wind in causing abrasions on the fruit, branches, and leaves, frost injury, die back and other diseases, and insect punctures. As remedial treatment the author recommends the removal and destruction of all diseased fruit, the cutting out and burning of dead and diseased branches, the raking and burning of leaves about the trees, and 3 or 4 applications of Bordeaux mixture, beginning early in the season.

In order to prevent the fruit from decaying after being gathered, it is suggested that it be washed with an ammoniacal solution of copper carbonate before shipping.

A disease of stone fruits, L. Trabut (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 10, pp. 213–216, fig. 1*).—A description is given of a disease of apricots, peaches, and cherries caused by the fungus *Coryneum beyerinckii*.

Ordinarily the fungus is said to only attack the leaves and produce comparatively little injury, but recently it has occurred in greater intensity and 2 distinct forms are recognized, one being limited to the blade of the leaf, while the other is more generalized and attacks the young shoots and branches, causing a production of gum which is particularly noticeable in the case of the apricot. The injury is in proportion to the prevalence of the fungus.

Its occurrence may be combated by the use of Bordeaux mixture or a modified Bordeaux mixture recommended by the author, which consists of water 100 liters, iron sulphate 500 gm., copper sulphate 500 gm., and lime 500 gm.

A dangerous gooseberry disease introduced into Denmark, E. ROSTRUP (*Haven, 4 (1904), No. 13, pp. 165, 166*).—Notes the occurrence of the gooseberry mildew (*Sphærotheca mors-uvæ*) and suggests spraying with potassium sulphid, or preferably burning the diseased plants to prevent the spreading of the disease.—F. W. WOLL.

White rot of vines (*Jour. Bd. Agr. [London], 11 (1904), No. 7, p. 434*).—A brief account is given of the white rot of grapes, due to *Coniothyrium diplodiella*. This fungus attacks vines growing in the open air on the continent of Europe, and has been recently reported as being met with on vines growing under glass in England.

The fruit is the part most frequently attacked, the fungus spreading throughout the cluster. The foliage is usually unaffected. When once established the disease spreads rapidly and every grape may become affected. When the stalks bearing the grapes are attacked the fungus forms slightly depressed areas of a brownish color, and these may extend along the side of the branches or may completely girdle the branch, and the injured zone soon dies. In vineyards the disease is most injurious during seasons of great humidity accompanied by high temperature, and under such conditions one-fourth to one-third of the crop may be destroyed within a few hours.

The best remedy is the removal of all diseased bunches of fruit, and spraying thoroughly at intervals of 5 days with a solution of permanganate of potash. This treatment will usually be found sufficient if the disease is of recent origin, but if it has spread to the branches all such diseased branches should be cut out and burned.

The oïdium of the grapevine, J. BURVENICH (*Tijdschr. Plantenziekten, 9 (1903), pp. 61-67*).—The writer calls attention to the discovery of Seelig that a 2 per cent solution of sodium carbonate proves an effective remedy against the oïdium disease and gives reports from several growers who had tested the remedy during the past season.

The conclusion drawn from these reports is that the solution is entirely effective even in a wet year, three sprayings being sufficient to prevent or check the disease. When a 3 per cent solution was used the leaves of the grapevines were seriously injured.—H. M. PIETERS.

A report on "spike" disease of sandalwood, E. J. BUTLER (*Indian Forester, Appendix Ser., 1903, Apr., pp. 1-11; abs. in Bot. Centbl., 96 (1904), No. 30, pp. 88, 89*).—A description is given of a disease of sandalwood, which the author believes is due to physiological disturbances bringing about a forced carbon assimilation. The diseased trees may be readily recognized by their narrow pointed leaves densely crowded together. The affected shoots do not cease growing, which is in marked contrast to the normal tree which is dormant during a considerable period of each year. The death of the tree often ensues, apparently through "exhaustion and starch poisoning."

A microscopical examination of the diseased tissues failed to show the presence of any parasitic organism, but there was found an enormous quantity of starch in the parenchymatous tissues, as well as the production of a well-marked palisade tissue which is absent in the normal leaves. It has been shown that similar modifications occur in structures when the plant is compelled to take in excessive quantities of carbon dioxid, and attention is drawn to the similarity of these changes and those causing the spike disease in sandalwood. The disease is said to show marked similarity to the peach yellows of this country, and like it there is reason to believe it is communicable.

ENTOMOLOGY.

Controlling the boll weevil in cotton seed and at ginneries, W. D. Hunter (*U. S. Dept. Agr., Farmers' Bul. 209, pp. 31, fig. 1*).—It has been shown that ginneries are a very important means of distributing this pest. A number of cases of infestation in Louisiana are thus accounted for. Cotton brought from Texas to gins in Louisiana may infest these gins and they may in turn serve as centers of further infestation. In one case it was ascertained that the farmer transported the pest 16 miles in this manner.

Elaborate series of experiments were carried out for the purpose of determining the value of hydrocyanic-acid gas and carbon bisulphid in destroying the cotton-boll weevil in infested seed. It was found that hydrocyanic-acid gas when used at twice as great a strength as required for the fumigation of grain failed to kill the boll weevils after 5 hours exposure at a depth of 6 to 10 in. in cotton seed. Similar results were obtained when house flies were placed at depths of from 6 to 12 in. in cotton seed. Carbon bisulphid was therefore resorted to as being a more promising insecticide. This substance was used at the rate of from 1½ to 10 lbs. per 1,000 cu. ft. When used at the greatest strength it penetrated and killed the boll weevils to a depth of 4½ ft. in cotton seed.

The slow rate of penetration indicated the futility of using carbon bisulphid in this form. Experiments were therefore tried in applying carbon bisulphid in an artificially volatilized form according to a method devised by W. E. Hinds. A current of air was passed through liquid carbon bisulphid and the resulting vapor was then driven by pressure through the cotton seed to the bottom of the containing cylinder and diffusion of the vapor under pressure was complete and rapid. In this manner it was found possible to kill boll weevils when the carbon bisulphid is used at the rate of 8 lbs. per 1,000 cu. ft. of space for a period of 40 hours.

The author also carried on experiments to determine whether it is possible to prevent the dissemination of this pest through the agency of cotton gins. Experiments along this line are under the immediate direction of James Hull, a practical cotton ginner. It was found that when weevils were passed through the main fan in a pneumatic elevator system with a rate of 1,800 revolutions per minute all the weevils were destroyed. When weevils were fed into the outer roll of a gin revolving at the rate of 400 revolutions per minute, 92.4 per cent came through alive. In these experiments it was found that in ginning, weevils may escape with the seed into the seed chute and also at the mote board. It is also shown that weevils may pass through cleaning feeders without being injured.

An account is given of the present systems of handling and ginning cotton seed in various localities. As a result of the author's observations and experiments it is recommended that a separate, seed-cotton storage house should be maintained and should be provided with special cleaners which may be of use in removing weevils and facilitating ginning. It is also recommended that in the gin house proper cleaner feeders and cotton cleaners be used more extensively and that all trash be treated so as to effectually destroy the weevils.

Experiments with the San José scale during 1904, W. Newell and R. I. Smith (*Georgia State Bd. Ent. Bul. 14, pp. 32, figs. 5*).—During the past year the authors conducted a series of experiments in summer and winter spraying of trees for the destruction of San José scale.

In these experiments 17 variations of the lime-sulphur-salt wash were tested. The experimental work in the use of winter washes began on February 26 and continued until March 3. In the preparation of the lime and sulphur mixtures the sulphur in nearly all cases was first made into a paste by adding it to boiling water. Detailed statements are given concerning the formulas and the methods of preparing all the mixtures used in the experiments. From these tests it appeared that all compounds

containing lime and sulphur gave good results, but compounds without these materials were uniformly unsatisfactory. It was found that when the washes were boiled for 30 to 35 minutes the compound was as effective as where the mixtures were boiled for an hour or more.

A series of experiments was also carried out in testing summer washes. The authors used a great variety of these washes, including various forms of kerosene emulsion, soap solutions, and proprietary mixtures. Of the various mixtures used none gave promising results. Even kerosene emulsion was not effective. The authors, therefore, discourage summer treatment and recommend that the fruit grower apply his remedies in winter.

The mixtures especially recommended for winter application are 3 in number and are prepared as follows: No. 1 contains 21 lbs. of lime and 18 lbs. of sulphur per 50 gal. of water. No. 2 is prepared in the same manner with the addition of 5 lbs. of salt per each 50 gal. of water. No. 3 contains 16 lbs. of lime and 8 lbs. each of sulphur and commercial caustic soda per 50 gal. of water. The authors recommend that the first application be made in December and that spraying should be completed before the buds begin to open. Some experiences were had in dipping trees before planting in a lime-sulphur wash, but peach trees thus treated were considerably injured and the practice is therefore not recommended.

The most important step in the cultural system of controlling the boll weevil, W. D. HUNTER (*U. S. Dept. Agr., Bureau of Entomology Circ. 56, pp. 7*).—The agitation in favor of an early crop of cotton for the prevention of boll weevil injury has been actively carried on by the Department. The matter of obtaining an early crop, however, is considered secondary in importance to the destruction of cotton plants in the field during the fall.

The author mentions 4 reasons why cotton plants should be destroyed in the fall: The fall destruction of cotton plants prevents the development of many weevils which would otherwise become adult within a few weeks of the time of hibernation. This process will also destroy a great majority of the weevils which have already become adult. The only weevils which survive the winter are those which become adult late in the season. The clearing of the cotton field in the fall permits the practice of fall plowing.

As a result of the general study of this problem the author recommends the passage of laws regulating the fall destruction of cotton plants in the fields. This method of control is believed to be the most effective one for actually reducing the numbers of the weevil.

The cotton boll weevil (*Trop. Agr., 24 (1904), No. 4, p. 228*).—Mention is made of cultural methods in their relation to the prevention of injury by the cotton boll weevil. It is claimed that when the cotton is sprayed with a solution of sulphate of copper at the rate of 2½ lbs. per 40 gal. of water a sufficient quantity of this substance is absorbed to kill the cotton boll weevil when it attempts to feed upon the boll. This method of treatment is estimated to cost about 15 to 20 cents per acre.

Some further comments on the Guatemalan boll-weevil ant, W. M. WHEELER (*Science, n. ser., 20 (1904), No. 518, pp. 766–768*).—This is a controversial article, in which the author argues that the Guatemalan ant is not an aggressive species and is not likely to prove of any great importance in controlling the boll weevil.

The pea weevil; its development and methods of combating it, M. J. RIVERA (*El bruco de las arvejas (Bruchus pisi) desarrollo y medios de combatirlo. Valparaiso: Instituto Agricola, 1904, pp. 20, figs. 6*).—This insect is described in its various stages, and notes are given on its distribution and host plants. Among the remedies recommended in controlling it mention is made of the application of heat to seed peas and fumigation with carbon bisulphid and hydrocyanic-acid gas.

The cabbage moth (Mamestra brassicæ) (*Bd. Agr. and Fisheries [London], Leaflet 109, pp. 4, figs. 2*).—This pest is described and notes are given on its habits

and life history. In combating the insect it is recommended that all the chrysalids be destroyed in the ground in winter, and the desirability of hand picking the caterpillars and maintaining poultry in cabbage patches is suggested. Infested cabbages may also be dusted with gas lime.

Circular in relation to some injurious insects and plant diseases, W. B. Alwood (*Virginia Sta. Spec. Bul., Aug., 1904, pp. 25, figs. 24*).—Brief descriptive, biological, and economic notes on San José scale, woolly aphis, crown gall, peach yellows, black knot, and pear blight. The anatomy of the San José scale is described and notes are given on the plants which it is known to infest.

The raspberry-cane maggot, W. H. Lawrence (*Washington Sta. Bul. 62, pp. 13, figs. 5*).—During the past 3 years this pest has appeared in raspberry fields especially in the western part of the State. It is referred to under the species *Phorbia rubivora*. The maggots either kill the canes outright or damage them by girdling near the tips.

Notes are given on the habits and life history of the pest. A hymenopterous parasite not definitely determined was reared from the cane maggots. On account of the habits of this pest it is impossible to combat it by spraying. The only successful method of controlling the insect is to collect and destroy the infested canes at the time when the maggots are transforming to pupæ. This occurs in Washington in May or the early part of June.

The raspberry-root borer, or the blackberry-crown borer, W. H. Lawrence *Washington Sta. Bul. 63, pp. 15, figs. 4*).—Biological, economic, and descriptive notes are presented on *Bembecia marginata*. During the past 4 years this insect has caused considerable damage in Washington. Infested plants, however, have not as a rule died outright, but have merely showed a poor growth. The nature and extent of the injury caused by this pest are briefly described.

The insect has no natural enemies of its own kind. Robins, however, were observed feeding upon the moths. In combating the pest it is recommended that infested plants be dug up and burned, or that the larvæ be destroyed by cutting and burning old canes. Chickens are believed to be beneficial in catching the moths. It is suggested that the larvæ may be destroyed by insecticides such as arsenicals or bisulphid of carbon.

Some common insects injurious to the apple, R. I. Smith (*Georgia State Bd. Ent. Bul. 13, pp. 19, figs. 7*).—Notes are given on the habits, life history, and means of combating 4 of the most injurious apple pests in Georgia.

The woolly aphis may be most successfully controlled by applying tobacco dust about the roots of the trees. For this purpose the soil may be removed to a depth of 3 or 4 in. for 2 or 3 ft. around the trunk of young trees and after the tobacco dust is applied the soil may be put back in its original position. Both round-headed and flat-headed apple-tree borers may be combated by digging out in the larval condition by means of a sharp knife or wire. Some good may also be done by applying whitewash or a thick alkali soap to the trunks of trees, or the tree may be wrapped with thick brown paper to a height of about 18 in. from the ground.

Codling moth may be effectively controlled by spraying with arsenicals and the use of bands. The insecticide should be applied just after the petals have fallen and the formula recommended by the author is 6 oz. of Paris green or 2½ lbs. of arsenate of lead for each 50 gal. of Bordeaux mixture prepared by the 4-6-50 formula.

Insects and diseases affecting the apple, R. W. Scott, Jr. (*Agr. Education, 7 (1904), No. 1, pp. 24, 25*).—Brief notes on woolly aphis, apple-tree borers, tent caterpillars, and other insect pests and fungus diseases. Spraying with Bordeaux mixture and Paris green or arsenate of lead is recommended.

Three common insect pests of western Washington, W. H. Lawrence (*Washington Sta. Bul. 65, pp. 14*).—The habits, life history, and general appearance of oyster-shell bark-louse are briefly described. In combating this pest the author made spraying experiments in both summer and winter. In summer whale-oil soap, whale oil and

quassia, resin and sal soda, kerosene emulsion, and mechanical mixtures of kerosene and water were used. In winter the author tested the effects of kerosene emulsion, kerosene and water, lye, lime and sulphur, lime-sulphur-salt solution, and an emulsion of crude oil. A lime and sulphur mixture prepared according to the 1-1-4 formula gave good results from a single application. It proved more efficient than lye solution and cheaper.

A similar study was made of the woolly aphis, and notes are given on its appearance, habits, and life history. In spraying for this pest the author used the whale-oil-tobacco decoction, whale-oil soap solutions, whale oil and quassia, kerosene and crude-oil emulsions, and kerosene and water. The crude-oil emulsion was found to cause some injury when sprayed on the leaves. Kerosene emulsion used at the rate of one part to 10 or 12 of water gave good results. The pear and cherry slug was also studied and notes are given on its habits, life history, and natural enemies. Good results were obtained in combating this pest by the use of Bordeaux mixture, soap solutions, Paris green, white arsenic, buhach, and hellebore.

The codling moth, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 25 (1904), No. 4, pp. 401-406*).—In Cape Colony the codling moth is believed to require about 2 months for its complete life cycle. Notes are given on the habits and life history of this pest. The codling moth may be held in check by 3 or 4 applications of arsenical sprays combined with the thorough use of bands.

The woolly aphis, B. de la Grye (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 5, pp. 403-407*).—Brief biological and economic notes are given on woolly aphis, oyster-shell bark-louse, *Tortrix viridana*, and *Hyponomeuta pomonella*.

San José scale-insect experiments in 1904, W. E. Britton and B. H. Walden (*Connecticut State Sta. Bul. 146, pp. 32, pls. 4*).—In the season of 1904 experiments were made on over 4,000 fruit trees in testing the effects of various insecticides for the control of the San José scale.

Various materials were used in the preparation of these insecticides according to 15 formulas. Nearly all of the insecticides contained lime or sulphur in one form or another. It is believed that if spraying be done before the first of December it may be possible to kill some of the young scales at that time. Ordinarily about 25 per cent of the San José scale are killed during the winter. A much greater number, however, about 50 per cent, were killed during the past winter as a result of the unusually severe climatic conditions. These facts must be taken into consideration in estimating the effects produced by different insecticides.

The spraying experiments conducted by the authors were carried out in various localities in different parts of the State. About 800 trees were treated in December and 3,200 trees were sprayed in March and April. The trees suffered considerably from the severe winter weather and this fact makes it impossible to express in exact figures the effectiveness of the insecticides. Good results were obtained from both fall and early winter spraying with both the boiled and unboiled lime and sulphur mixtures. The boiled mixture of lime and sulphur in which as much or little more lime than sulphur is used, is perhaps as efficient and cheap a remedy as has been devised for ordinary orchard work.

Among the mixtures which were prepared without boiling, potassium sulphid and lime proved very effective but was rather expensive. Caustic soda failed to give satisfactory results and its effect upon the skin renders it a disagreeable insecticide to use. During the season about 100,000 fruit trees were sprayed by orchardists in Connecticut with lime and sulphur mixtures. The results were very satisfactory.

Fall spraying with sulphur washes, P. J. Parrott and F. A. Sirrine (*New York State Sta. Bul. 254, pp. 317-337, pls. 6*).—Experiments were carried out in 3 orchards located in Geneva and Queens, New York. The orchards included all the common fruit trees, some of which were infested with San José scale and others not. The time of application of the insecticides ranged from November 8 to 27.

The purpose of the experiments was to determine whether the San José scale could be as effectively combated by fall applications of insecticides as by spring treatment. The washes used in these experiments included lime-sulphur-salt wash prepared with and without external heat; lime-sulphur wash, and lime-sulphur caustic-soda wash also prepared with and without external heat. The formula for boiled lime-sulphur-salt wash was 15 lbs. each of lime, sulphur, and salt per 50 gal. of water; for self-boiled lime-sulphur-salt wash, 40 lbs. lime, 20 lbs. sulphur, and 15 lbs. salt per 60 gal. of water; for lime-sulphur wash, 15 lbs. each of lime and sulphur per 50 gal. of water; and for the lime-sulphur caustic-soda wash with and without heat, 30 lbs. lime, 15 lbs. sulphur, and 6 lbs. caustic soda per 50 gal. of water.

In the first orchard some loss of bloom and foliage occurred as a result of spraying. The lime-sulphur wash was least destructive. The trees later improved in condition, however, and ultimately equalled the check trees in appearance. In the second orchard plum blossoms were destroyed to the extent of 10 to 50 per cent and slight injuries were caused to foliage. The Morello cherries also lost about 5 per cent of their blossoms and similar damage was caused to apples and pears. In the third orchard the sprayed trees were, with few exceptions, unaffected by the treatment.

The work thus far carried out indicates that sulphur washes when applied in the fall may cause some injuries which are noted when these insecticides are used excessively in the spring. Hardy varieties of trees, however, may well be sprayed in the fall, especially since the increased vigor and usefulness of treated trees more than compensate for possible losses in fruit yields. All the insecticides used by the authors were equally effective in destroying the San José scale. The addition of caustic soda or salt to the lime-sulphur wash did not add to its insecticidal power. The lime-sulphur wash boiled by means of fire or steam and the lime-sulphur caustic-soda wash prepared without the use of external heat are especially recommended for orchardists.

Fall use of sulphur sprays, F. H. Hall, P. J. Parrott, and F. A. Sirrine (*New York State Sta. Bul. 254, popular ed., pp. 8, fig. 1*).—A condensed form of Bulletin No. 254 of this station (see above).

Kerosene-limoid mixtures. New and most promising remedies for San José scale, aphides, and other sucking insects, C. P. Close (*Delaware Sta. Press Bul. 14, pp. 4*).—Experiments are reported concerning the use of various mixtures of limoid with kerosene, Bordeaux mixture, copper sulphate, Paris green, rosin soap, etc.

Limoid is described as a hydrated magnesian lime. The lime is finely ground and treated in a special manner. The most useful property of limoid seems to be its absorption of kerosene. It is thus possible to prepare effective insecticide mixtures without boiling or the use of heat in other ways. Mixtures of limoid and kerosene are prepared so as to contain various proportions of kerosene, between 10 and 25 per cent. Four lbs. of limoid are required to absorb 1 gal. of kerosene. The mixture may be made to adhere more perfectly by the addition of rosin soap. Its insecticide value also appears to be enhanced somewhat by this addition.

In the experiments reported by the author it was found possible to make a more complex mixture containing limoid, kerosene, and Bordeaux mixture, to which Paris green may also be added. This complex mixture is thus effective against the common sucking insects, biting insects, and fungus diseases. As compared with the ordinary lime-sulphur-salt wash, a mixture of kerosene and limoid gave almost equally satisfactory results. Apparently, San José scale may be entirely destroyed by a mixture of limoid and kerosene.

The use of kerosene as an insecticide, S. Mottet (*Rev. Agr. Réunion, 10 (1904), No. 4, pp. 64, 65*).—A general description is given of the different methods of preparing kerosene for use as an insecticide so that this remedy may be applied with

the least danger of causing harm to plants and the most effective results in the destruction of insect pests.

Motive power in spray outfits, W. L. SUMMERS (*Jour. Agr. and Ind. South Australia, 8 (1904), No. 2, pp. 81–83, figs. 3*).—An account is given of the comparative advantages to be derived from the use of power spraying outfits together with estimates of the cost of manipulating hand power and gasoline power outfits.

Brief notes on mosquito larvæ, H. R. DYAR (*Jour. New York Ent. Soc., 12 (1904), No. 4, pp. 243–246*).—The appearance and habits of the larvæ of a number of species of mosquitoes are briefly described. The name *Culex æstivalis* is proposed in the place of *C. reptans* for a species of mosquito which proves not to be identical with *C. reptans* of Europe.

Mosquitoes or Culicidæ of New York State, E. P. FELT (*New York State Mus. Bul. 79, pp. 241–400, pls. 57, figs. 113*).—In this bulletin the author presents a summary of the knowledge which has thus far been obtained regarding the habits and life history of mosquitoes, and also their agency in the transmission of malaria, yellow fever, filariasis, etc.

A discussion is presented of the distribution and abundance of mosquitoes, their migration during flight, life history, means of collecting and breeding, usual breeding places, natural enemies, and methods of control. The greater portion of the bulletin is occupied with a detailed description of the various species found in New York. A bibliography containing the more important references to American species of mosquitoes is appended to the bulletin.

The eggs of Culex territans, F. KNAB (*Jour. New York Ent. Soc., 12 (1904), No. 4, pp. 246–248*).—The eggs of this species were found in considerable numbers attached to the sides of rain barrels some distance above the surface of the water. The eggs of the same species were also found at the margin of ponds attached to tussocks of grass. It is believed that they do not hatch until they come in contact with the water. The egg cluster contains about 130 eggs.

In western Massachusetts *C. territans* appeared to be the only species of this genus which bred in large numbers and continuously throughout the summer.

National Mosquito Extermination Society (*Nat. Mosquito Extermination Soc. Bul. 1, pp. 41, figs. 5*).—In this bulletin a number of biographical notices are given of men most actively identified with the movement for the extermination of mosquitoes in this and other countries. The objects of the National Mosquito Extermination Society are stated, and brief accounts are given of some work already carried out in the destruction of mosquitoes.

Disappearance of the tsetse fly, J. W. ARNOLD (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 10, pp. 928, 929*).—The author relates his experience with the tsetse fly in Zululand. It appears that this insect may apparently disappear for a year or more in a given district and may then reappear in the usual numbers. Wherever big game and other wild animals are found along the coast belt there appears to be no assured safety from tsetse-fly attacks.

FOODS—NUTRITION.

Air, water, and food from a sanitary standpoint, ELLEN H. RICHARDS and A. G. WOODMAN (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, 2 ed., pp. 262, figs. 13, map 1*).—The authors state that in preparing the second edition of this useful text-book, the chapters on analytical methods have been considerably enlarged with a view to making the work more adapted to the needs of chemical and sanitary engineers, as well as to general students and householders. The bibliographical data, which is a feature of the book, has also been revised and extended.

Preservation of flour by cold, BALLAND (*Compt. Rend. Acad. Sci. Paris, 139*

(*1904*), *No. 9*, *pp. 473–475*).—Fine flour preserved for 3 years at an ordinary temperature was slightly bleached, bitter, and not suited for food, the gluten being in clots and inelastic and containing 64.5 per cent of water. Less ether extract was obtained than from the original flour, and the acidity was increased.

A sample preserved for the same length of time at a temperature of +2 and −2° C. was rather damp and tasteless, owing, the author believes, to the presence of moisture in the apparatus. It contained slightly more gluten than the original sample; the gluten was homogeneous and sweet and contained 71 per cent of water. The acids and ether extract were present in the same proportions as in the original material. Data regarding low-grade flour are also given. The tests are discussed with reference to the storage of flour.

Our foods, A. Hasterlik (*Unsere Lebensmittel. Vienna and Leipzig: A. Hartleben, 1904, pp. VIII+408, figs. 3*).—The principal animal foods, vegetable foods, and condiments are described, and their origin, composition, food value, and related topics are discussed.

The proteids of wheat gluten and their relation to the baking quality of flour. I, Proteids of wheat gluten, J. König and P. Rintelen (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *8* (*1904*), *No. 7*, *pp. 401–407*).—The investigations reported are in harmony with those of Ritthausen, and lead to the conclusion that wheat gluten contains 3 distinct proteids, gluten fibrin, gliadin, and mucedin, all of which are soluble in 60 to 70 per cent alcohol, and that one of these, namely, gluten fibrin, is dissolved in stronger alcohol (88 to 90 per cent), while the third, mucedin, is soluble in weaker alcohol (30 to 40 per cent).

Studies were also made with 3 sorts of spelt. Using alcohol of different strengths, 3 proteids were obtained, but although several kilograms of flour were used it was not possible to obtain the gluten fibrin and mucedin in a pure state. The ash-free gluten of the different samples contained from 17.61 to 17.74 per cent nitrogen, which agrees very closely with the value for wheat gliadin, and the conclusion is reached that this body in wheat and spelt is identical. Further investigations, however, are regarded as necessary before it can be known whether the other proteids are present in the same proportion in the gluten of the 2 grains.

Yellow bread, A. Schmid (*Jahresber. Thurgau. Kanton. Lab.*, *1903*, *pp. 6, 7; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *8* (*1904*), *No. 7*, *p. 438*).—It was shown that yellow spots observed in bread were due to the action of certain color-producing molds, and could be avoided by using a different sort of water in mixing the dough.

The production and consumption of meat and dairy products (*Public Health* [*London*], *17* (*1904*), *No. 2*, *pp. 90, 91*).—According to data summarized by R. H. Rew, the average annual consumption of milk in Great Britain per person was 15 gal., cheese 10.5 lbs., butter 18.5 lbs., and meat 121.8 lbs. The latter included 56.8 lbs. of beef and veal, 27.5 lbs. of mutton and lamb, and 36.8 lbs. of bacon and pork. These quantities do not include poultry, game, rabbits, etc., neither do the values for milk include skim milk or condensed milk.

Artificial refrigeration in Italy from the standpoint of hygiene and social economics. The phosphorescence of meat, E. Perroncito (*I frigoriferi all' estero ed in Italia dal punto di vista dell' igiene e dell' economia sociale. La fosforescenza delle carni. Turin: G. Castellotti, 1904, pp. 39, figs. 11*).

Studies of the spoiling of preserved foods, K. von Wahl (*Ber. Grossh. Bad. Landw. Vers. Anstalt Augustenberg, 1903, pp. 35, 36; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *8* (*1904*), *No. 7*, *p. 442*).—Differences in the power of resistance of different sorts of spores are spoken of, and the fact pointed out that the medium in which the spores are cooked exercises a marked germicidal effect, cooking with carrot liquor being the most marked in this respect of the materials tested. Bean liquor was less effective, though more effective than pea liquor. By repeated cooking the car-

rot liquor became more effective, and it appears that heating produced some sort of decomposition, probably of sugar, which resulted in the production of bodies with germicidal properties. The small amount of acid present was without effect.

The influence of sterilizing food, A. CHARRIN (*Compt. Rend. Acad. Sci. Paris, 139 (1904), No. 2, pp. 160–162*).—Unfavorable results attended the feeding of sterilized food under aseptic conditions in experiments with guinea pigs. The author concludes that in such cases a certain amount of the food does not exercise its full nutritive value, or at least escapes digestive changes.

The evils of boron preservatives (*British Food Jour., 6 (1904), No. 70, pp. 203, 204*).—A brief note of experiments by C. Harrington in which cats given on an average 0.5 gm. of borax for 133 days either became ill, died, or when killed at the close of the experiment were found, with one exception, to be suffering from nephritis.

The nutritive value of meat extract, E. BÜRGI (*Arch. Hyg., 51 (1904), No. 1, pp. 1–18*).—The experiments reported have to do with the controversial question whether or not meat extract increases metabolism. The conclusion is drawn that the material taken in this form is rapidly excreted and that the extract bodies are not foods. The rate of excretion was noted, and it was observed that there was some variation in the rapidity with which the nitrogen and carbon in the meat extract consumed were eliminated.

The behavior of meat extractives in the animal body, M. RUBNER (*Arch. Hyg., 51 (1904), No. 1, pp. 19–61*).—An exhaustive discussion of the subject, some of the author's investigations being reported. The author concludes that the meat extractives after they have served their purpose for stimulating digestion are excreted as soon as may be from the body.

Concerning the solubility of milk and casein in pepsin-hydrochloric acid, A. ZAITSCHEK and F. VON SZONTAGH (*Arch. Physiol. [Pflüger], 104 (1904), No. 9–12, pp. 550–563*).—The experiments showed that human milk and that of asses and mares was entirely soluble in pepsin-hydrochloric acid under the experimental conditions, and only 8 to 15 per cent of the casein of cows', buffaloes', and goats' milk. Other differences in the several sorts of milk are spoken of.

The metabolism of matter and energy in an artificially nourished infant, F. TANGL (*Arch. Physiol. [Pflüger], 104 (1904), No. 9–12, pp. 453–513*).—In the experiments reported an infant was fed modified milk. The digestibility of the food and the metabolism of nitrogen and of the ash constituents were studied, and the income of energy in the food was compared with the outgo in the urine and feces. The modified milk was as well utilized by the child, who was healthy though not very strong, as is cows' milk by strong children.

Metabolism in old age, S. FENGER (*Skand. Arch. Physiol., 16 (1904), No. 3–4, pp. 222–248*).—The author studied the diet and metabolism of nitrogen of an individual at intervals during a period of about 15 years, the subject being a woman 61 years old at the beginning of the experimental period.

From choice the diet was very simple, consisting of such foods as egg, oatmeal, soup, skim milk, sugar, fruit, and a little wine. The protein consumed per kilogram of body weight was not far from 2 gm., the energy value being about 26.4 calories. Notwithstanding these low values, the subject remained in good health. A number of experiments on the effect of varying amounts of protein and energy were carried on.

The author concluded that age (75 years) did not hinder the organism from very promptly making good a loss of nitrogen when a more abundant diet followed a period characterized by a limited supply. He points out that for 15 years no salt was eaten except that naturally present in the food, and that the amount taken daily was only about 1.5 gm., of which about half was excreted in the feces and the remainder in the urine. This he believes shows that the minimum requirement for this constituent is lower than has been supposed, at least in old age.

It was, of course, impossible to say whether or not the subject would have been in a better condition on another diet, but the author considers it fair to conclude that a diet may be considered suitable to old age which contains protein enough to supply the body demands and maintains the person in health throughout long periods, requirements which the present diet evidently met.

The amount of carbon dioxid excreted when muscular work is performed, G. KORAEN (*Skand. Arch. Physiol., 16 (1904), No. 5–6, pp. 381–389*).—Continuing earlier work (E. S. R., 14, p. 789), the author was himself the subject of experiments in which the muscular work was measured with specially constructed apparatus, and the respiratory quotients determined in a respiration apparatus.

It was found that both hunger and severe muscular work diminished the production of carbon dioxid when work was performed as well as during rest, a change which was not effected by a diet of fat. On the other hand, the use of sugar increased the production of carbon dioxid to its normal amount when work was performed. The observed data indicate that in hunger with a diet of fat the glycogen content of the body is used up or reduced to a minimum, and hence muscular work causes an increased cleavage of body fat.

If the body has opportunity to accumulate more glycogen, it again takes part in the metabolic processes in the same way as before. The amount of glycogen in the body, therefore, plays a by no means unimportant rôle in the cleavage processes brought about by muscular work, but how important the experiments reported do not show.

Factors affecting pancreatic digestion: pancreatic juice, kinase and trypsin, antikinase, A. DASTRE and H. STASSANO (*Arch. Internat. Physiol., 1 (1904), No. 1, pp. 86–117, fig. 1*).—From their experiments, the authors conclude that 3 bodies are concerned in pancreatic digestion, namely, kinase, inactive pancreatic juice, and antikinase, and that each of these to a certain degree preserves its individuality. The use of antikinase for judging commercial trypsin and pancreatic juice is spoken of.

The periodical activity of the digestive apparatus when digestion is not in progress, W. BOLDIREFF (*Zentbl. Physiol., 18 (1904), No. 16, pp. 489–493, fig. 1, dgms. 2*).—From experiments with dogs with suitable fistulæ a number of conclusions were reached. It was found that the digestive apparatus was periodically active when not employed in digesting, the periods of general activity regularly alternating with periods of inactivity. The periods of activity were some 20 or 30 minutes, and those of inactivity 1 hour and 30 minutes to 2 hours and 30 minutes. Rhythmic movements of the stomach were also noted during periods of active digestion. The character of the digestive juice secreted and other points are discussed.

The form in which glycogen occurs in organs, H. LOESCHCKE (*Arch. Physiol. [Pflüger], 102 (1904), No. 10–12, pp. 592–631*).—According to the author's conclusions there is no reason to suppose that glycogen occurs in the animal organs in chemical combination. The investigations reported have to do with the possibility of the complete extraction of glycogen with hot water..

Experiments on glucose formation in the organs of mammals, P. PORTIER (*Ann. Inst. Pasteur, 18 (1904), No. 10, pp. 633–643*).—Experiments are reported and discussed. When a sufficient amount of an antiseptic, as sodium fluorid, was used the glucose was not produced under the experimental conditions from the expressed juice of animal organs, though it was produced in the presence of chloroform without an antiseptic.

Is albumin transformed into fat by simple maceration? A. SLOSSE (*Arch. Internat. Physiol., 1 (1904), No. 2–3, pp. 348–358*).—On the basis of experimental evidence the conclusion is reached that macerated proteid substances in the presence of an antiseptic do not exert any influence on the quantity of fat present. In the

absence of antiseptics bacterial growth is possible, resulting in the production of fat. Fat may be also formed from pure albumins in a nonsterile medium.

The general conclusion is drawn that the formation of fat from protein with the aid of bacteria was as definitely shown as the fact that such formation could not occur without bacterial aid.

On the chemical composition of human feces on different diet, N. P. Schierbeck (*Overs. K. Danske Vidensk. Selsk. Forhandl., 1904, No. 2, II, pp. 23–51; Arch. Hyg., 51 (1904), No. 1, pp. 62–95*).—The author reviews the work of other investigators on the composition and fuel value of feces from widely differing diet, and gives the results of experiments in this line planned to throw additional light on the subject.

The experiments were conducted with 3 persons on ordinary mixed diets. The data for total ether extract and ash were generally found almost constant for the same individuals irrespective of the character of the diet, and the same was found to be the case with the proportion of albuminoid nitrogen, cellulose, and pentosans in the feces. In the case of different individuals, however, the nitrogen content of the feces differed greatly, 3 types being noticed, one with a nitrogen content of about 4 per cent with every diet, another with 6 to 7 per cent, and a third varying according to the character of the diet from 4 per cent in the case of coarse foods to 7 or 8 per cent when only a small amount of feces was voided.

Marked differences were observed in the percentage utilization of the dry matter, total nitrogen, and albuminoid nitrogen of the food on varying diets, while fat, ash, and carbohydrates showed a fairly uniform utilization in all cases.—F. W. WOLL.

ANIMAL PRODUCTION.

First report on concentrated feeding stuffs and cotton-seed meal, B. W. Kilgore, C. D. Harris, J. M. Pickel, and F. C. Lamb (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 12, pp. 3–36*).—The text of the State law regulating the sale of concentrated commercial feeding stuffs and the act regulating the sale, inspection, and branding of cotton-seed meal are quoted, and chemical and microscopical analyses made in compliance with the law reported for a number of samples of wheat bran, corn bran, mixture of wheat and corn bran, bran and shorts, shorts, chops, mixed or proprietary cow feeds, commercial mixed feeds, mill feeds, middlings, peanut middlings, rice meal, rice bran, and rice product, ship stuff, chicken feed, horse feed, and pig feeds, soy beans and corn, distillery slop, red dog flour, and cotton-seed meal.

Of the 37 samples of wheat bran examined 10 contained corn bran. Of the 123 samples of cotton-seed meal examined 102 contained as much protein as is required by the standard or more, while 21 samples were below the legal standard.

The authors point out that corn bran, rice chaff, ground corn cobs, peanut hulls, peanut middlings, and similar products when mixed with better feeding stuffs, without proper label or guaranty to indicate their presence, ought to be regarded as adulterants, and that the examinations reported show that such materials are being used quite frequently in the stock feeds for sale in the State.

Inspection of feeding stuffs, W. H. Jordan and F. D. Fuller (*New York State Sta. Bul. 255, pp. 341–366*).—The changes made in the feeding-stuff law by the State legislature of 1904 are noted, and a report given of the analyses of 263 samples, representing 203 brands, of cotton-seed meal, linseed meal, old and new process, dried distillers' grains, brewers' grains, malt sprouts, gluten meal and feed, germ oil meal, germaline, hominy feed, wheat bran and middlings, oats and oat by-products, compounded feeds, including cereal breakfast food by-products, proprietary feeds and similar goods, barley feed and meal, beet pulp, mixed poultry rations, scratching food, poultry bone, meat meal, beef scraps, blood meal, and similar products. At least 52 of the samples showed a larger deficit in protein than was regarded by the

author as reasonable. Eighteen of these samples deficient in protein were compounded and proprietary feeds, 9 linseed meal, and the remainder cotton-seed meal, dried distillers' grains, gluten feed, hominy feed, and poultry feeds in about equal proportion. One of the samples of cotton-seed meal was evidently cotton-seed meal mixed with ground hulls.

A feeding stuff made from molasses and seed-beet litter, W. Rosam (*Österr. Ungar. Ztschr. Zuckerind. u. Landw., 32 (1903), p. 947; abs. in Centbl. Agr. Chem., 33 (1904), No. 10, pp. 703, 704*).—A feeding stuff is described which is said to possess good keeping qualities and an analysis reported. Tests of the feeding value of this product for milch cows are briefly reported.

The effect of rust on the straw and grain of wheat, F. T. Shutt (*Wallaces' Farmer, 29 (1904), No. 49, p. 1502*).—The prevalence of rust this season in certain districts of Manitoba led the author to determine the composition of straw and grain from rusted wheat as compared with similar samples free from rust. The analytical data follow:

Composition of rusted and rust-free wheat straw and grain.

	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Straw from rust-free wheat	7.92	2.44	1.63	39.00	39.95	9.04
Straw from rusted wheat	7.92	7.69	1.97	38.44	36.78	7.20
Grain from rust-free wheat	12.26	10.50	2.56	70.55	2.29	1.81
Grain from rusted wheat	10.66	13.69	2.35	68.03	3.03	2.20

"The rust apparently does not affect the vitality of the wheat plant during the first stage or period, but as the season progresses and the ripening period advances the fungus attains the ascendency, crippling the energies and functions of the tissues, and checking the movement of the food materials to the seed. In other words, the growth of the rust arrests development and induces premature ripening, which, as we have seen, means a straw in which still remains the elaborated food, and a grain small, immature, rich in protein, and deficient in starch."

The digestibility of chitin and the nutritive value of insects, A. Zaitschek (*Arch. Physiol. [Pflüger], 104 (1904), No. 9–12, pp. 612–623*).—The digestibility of chitin was studied in experiments in which chickens were fed one species of the ephemera (May flies) with and without barley and barley alone. These insects are collected and sold in Austria-Hungary as feed for birds or fishes.

The conclusion was reached that chitin is entirely indigestible. The fat furnished by the insects was about half digested. As regards gains in nitrogen, the insects and the barley were about equal. The energy furnished by barley was better utilized than that supplied by the insects. The crude fiber consumed was not at all digested. The physiological nutritive value of the ration is spoken of.

The flesh of the chickens fed on insects exclusively had a disagreeable odor and flavor. Feeding grain with the insects modified the odor and flavor, though it did not do away with it altogether.

Sugar and molasses in the feeding of farm animals, P. Bonâme (*Sta. Agron. Mauritius, Bul. 10, pp. 38*).—The importance of sugar and molasses in the rations of farm animals is spoken of, and the experiments and experience of a number of investigators summarized. The author reports the analysis of a local commercial feeding stuff called "molassine," and describes the preparation of "molascuit" from bagasse and molasses. The need of supplementing this by nitrogenous feed is spoken of, and black peas (with pods) or ground acacia beans are recommended. In connection with this discussion some analytical data are quoted.

Phosphoric acid in the ration of herbivora, H. Joulie (*Rev. Agr. Réunion, 10 (1904), No. 5, pp. 84–86*).—In a paper presented before the Société d'agriculture de

Vaucluse, the author reports experiments on the use of phosphoric acid for herbivora which led to the conclusion that such an addition was beneficial.

Metabolism experiments with the end products of peptic and tryptic digestion of protein, E. J. LESSER (*Ztschr. Biol.*, *45* (*1904*), *No. 4*, *pp. 497–510*).—Experiments with dogs led to the conclusion that while the digestion product obtained with pepsin might perhaps replace protein this was not the case with the tryptic digestion product.

Intraorganic combustion, J. TISSOT (*Compt. Rend. Acad. Sci. Paris*, *138* (*1904*), *No. 24*, *pp. 1545–1547*).—The author concludes from his experiments with a dog that intraorganic combustion is independent of the amount of oxygen in the arterial blood.

Text-book of animal production, G. PUSCH (*Lehrbuch der allgemeinen Tierzucht. Stuttgart: Ferdinand Enke*, *1904*, *pp. XII+388*, *figs. 195*).—This volume contains chapters on the principles of animal production, races, breeds, breeding, feeding, and management of farm animals, and related topics, as well as descriptions of breeds, construction of stalls, etc., the volume being designed as a text-book for students.

Domestic animals, E. V. WILCOX (*New York State Library Legislation Bul. 220*, *pp. 17–26*).—The laws enacted during the past year in 28 States relating to domestic animals are summarized, including those dealing with the inspection of animals, watering of stock, trespassing, and other topics.

Feeding experiments with cattle, E. A. BURNETT and H. R. SMITH (*Nebraska Sta. Bul. 85*, *pp. 22*, *figs. 5*).—A lot containing 20 steers was fed on an average 6 lbs. of grain and a similar lot of 15 animals 3 lbs. of grain per head per day in addition in each case to alfalfa hay and prairie hay, while a third lot also containing 15 steers was fed the hay only, the object being to study the value of hay with and without grain. The grain mixture used consisted approximately of corn, bran, oats, and oil meal in about the proportion of 5:3:3:1.

In the 18 weeks of the test the average daily gain per steer ranged from 0.56 lb. with the lot fed no grain to 1.57 lbs. with the lot fed the larger grain ration. The gain was most cheaply made with the latter lot, costing 4.53 cts. per pound, and least cheaply with the former lot, costing 7 cts. per pound. The greatest range in feed eaten per pound of gain was also noted with these two lots, being from 9.6 to 23.7 lbs. After the test closed in the spring the lots were grazed for about 7 months. The greatest gain, 212 lbs. per steer, was made by the lot previously fed hay only and the least gain, 176 lbs. per steer, by the lot which had formerly received the larger grain ration. Considering both feeding periods, the cost of a pound of gain ranged from 3.14 cts. with the lot fed the light grain ration, to 3.46 cts. with the lot fed the heavy grain ration.

"Calves which have been full grain-fed during the winter are certain to lose a part of their grain flesh when placed on green grass without grain. On the other hand, wintering without grain of any kind and allowing calves to run down in flesh and lose weight and vitality is not economical. A small grain ration added to hay or stalks or both keeps the digestive tract in better condition and produces enough better gains to pay a good price for the grain fed, while it does not keep young steers from eating roughness in considerable quantity, a factor of importance in the economical production of beef."

Shortly after the close of the above test the steers were divided into 5 uniform lots of 10 each for use in a test of the relative value of different sorts of coarse fodder. Lots 1 and 3 were fed prairie hay and alfalfa hay, respectively, with corn as a grain ration. Lots 2, 4, and 5 were fed prairie hay, corn stover, and sorghum, respectively, the grain ration consisting of corn with oil meal.

In the 6 months covered by the trial the average gain ranged from 1.35 lbs. per head per day with lot 1 on corn and prairie hay to 1.97 lbs. with lot 3 on corn and alfalfa hay. The smallest amount of grain, 7.7 lbs., and total food, 12.4 lbs., eaten per pound of gain was noted with the last-mentioned lot and the largest amounts of

grain and total food, 10.5 lbs. and 17 lbs., were noted with lot 1. The cost of a pound of gain ranged from 6.04 cts. with lot 3 (corn and alfalfa) to 8.27 cts. with lot 1 (corn and prairie hay). According to the authors' calculations the smallest profit, 38 cts. per head, was obtained with lot 1 and the greatest, $8.66 per head, with lot 3. The authors' conclusions follow:

"Some protein-rich food like oil meal, added in small quantity to a ration of corn and prairie hay, to give a better balance of nutrients, lessens very considerably the amount of food required for a given gain, and lessens the cost of gains.

"A combination of alfalfa hay and corn makes a satisfactory ration without commercial protein foods, being much superior to corn and prairie hay.

"Field-cured cornstalks fed with corn and a little oil meal give large and cheap gains, emphasizing the importance of harvesting the stalks for winter feeding."

Corn versus corn and oil meal for finishing steers on grass was tested with 2 lots of 5 animals each. On corn the average daily gain was 1.63 lbs., the grain eaten per pound of gain 10.9 lbs., and the cost of a pound of gain 7.41 cts. On corn and oil meal similar values were 2.02 lbs., 8.8 lbs., and 6.55 cts.

"The results would indicate that the corn and grass in this experiment did not supply sufficient protein for cheapest gains. It was very noticeable all through the experiment that the lot having oil meal was much less troubled with scours, which may partially account for the greater gains of that lot.

"Having received but little grain on alfalfa the first winter, a half grain ration the second winter, and full feed on grass the following summer, these steers consumed for the whole period an average of but 5.9 lbs. of grain for 1 lb. of gain."

The score card in stock judging at agricultural colleges, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 61, pp. 124, pls. 16, figs. 11*).—A summary of data regarding the use of score cards at the American agricultural colleges.

Information for importers of animals for breeding purposes, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 50, pp. 16*).—A list is given of the books of record of pedigrees certified by the Department of Agriculture to date, together with the rulings of the Secretary of the Treasury which have to do with the importation of live stock.

The Indian water buffalo, F. Limouzin (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 8, pp. 743, 744*).—It is stated that though the Indian water buffalo may be used for plowing and sometimes for hauling heavy timber, yet these animals are not satisfactory for draft purposes, since they are very slow in their movements. They are sometimes milked and butter made from the milk, but both the butter and milk are insipid and almost tasteless. In the author's opinion the animals are of no value when slaughtered, the meat being tasteless, tough, and very coarse.

Barbados sheep, G. M. Rommel (*Breeder's Gaz., 46 (1904), No. 19, p. 845, fig. 1*).—The so-called woolless sheep from Barbados, recently imported into this country by the Bureau of Animal Industry of the Department of Agriculture, are described. It is thought that these sheep may prove useful for the production of mutton in the southern States.

Studies on the feeding of work horses, VIII, L. Grandeau and A. Alekan (*Ann. Sci. Agron., 2. ser., 9 (1904), I, Nos. 1, pp. 30–70; 3, pp. 330–357*).—The special object of the experiments was to learn the effect of sugar added to a ration. The tests were made with 3 horses engaged in different kinds of work, the special characteristics of the rations tested being hay alone and with sugar, maltine, corn with sugar, and "granules" alone and with sugar. The so-called "granules" consisted of a mixture of commercial by-products and were especially rich in protein.

The coefficients of digestibility of the various rations were determined. In addition to the usual constituents the authors took into account the total and saccharifi-

able cellulose, starch, glucose, sugar, peptic acid, total, albuminoid and amid nitrogen, and undetermined material.

As regards the effect of sugar on the digestibility of carbohydrates the authors point out that in the ration of hay without sugar the coefficients of digestibility were for total crude fiber 35.24, saccharifiable cellulose 43.81, undetermined material 38.51, and organic material not including sugar 44.11 per cent. In the case of a ration with sugar the coefficients were for total crude fiber 38.95, saccharifiable cellulose 49.79, undetermined material 52.45, and organic material not including sugar 47.18 per cent. Similar values are given for the other rations with and without sugar.

The effect of sugar on the digestibility of nitrogenous constituents and fat is also spoken of, the general conclusion being drawn that sugar did not materially affect the digestibility of the other constituents of a ration. The authors note that in general the amid nitrogen was less completely digested than proteid nitrogen. The results obtained with ether extract, as is generally the case, were not altogether satisfactory. In the experiments with hay and maltine, peptic acid was quite thoroughly digested.

Poultry rearing and fattening in Ireland, H. DE COURCY (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 5, pp. 257–268, figs. 3*).—Poultry raising in Ireland is spoken of, particularly the work of the Irish Poultry Society, and brief statements made regarding a feeding experiment in which 4 lots of 6 cockerels each were fed with a cramming machine for 21 days.

On a ration of equal parts of barley meal, ground oats, and fine sharps wet with skim milk, a little fat being added during the last 7 days, the total gain was 8 lbs. 10 oz. On ground oats and corn meal 1:1 with skim milk and fat as above the total gain was 7 lbs. When the grain fed was ground oats, corn meal, and barley 1:1:2 the gain was 9 lbs. 14 oz., and on a ration of equal parts of ground oats and corn meal wet with water, fat being added as before during the last week, the gain was 6 lbs. 2 oz. The methods of dressing and marketing poultry are also spoken of.

The amount of air space required in poultry houses, K. J. J. MACKENZIE and E. J. RUSSELL (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 84–102, figs. 5, dgm. 1*).—Observations are reported on the frequency with which chickens breathe and the amount of inspired and respired air, as well as determinations of the amount of carbon dioxid in the respired air and in the air of poultry houses of different construction.

The authors state that the rate of breathing may be readily measured by placing a finger on the intercostal muscles under the wing and counting the respirations in a given period of time, the birds being trained beforehand so that they are not disturbed by handling. The average rate of respiration is given as 33 per minute for a young bird and 27 for an older bird. The amount of air breathed in and out was measured by slipping a rubber tube wide at one end over the bird's head and connecting the other end with a large flask fitted with a water gauge. As the chicken breathed the fluctuations in the air pressure were read and the volume of respired air calculated.

From the average of a number of observations the authors conclude that chickens breathe about a pint of air per minute, or 1.2 cu. ft. per hour. Older birds breathe more air each time than younger birds, but breathe more slowly. With an insufficient air supply respiration, it was found, was impeded.

The amount of carbon dioxid in the respired air was measured by means of a respiration apparatus in which the chickens were kept in a sheet-iron box with a glass front through which a current of air was pumped, the experimental data being very briefly reported. The proportion of carbon dioxid which poultry can endure with impunity was not directly determined, but the authors estimate it provisionally at 9 volumes in 10,000 of air and calculate that, therefore, each bird requires at least

35 cu. ft. of air per hour if this limit is not to be exceeded, though they recommend a freer air supply and consider 40 cu. ft. more satisfactory.

The air requirement of a medium fowl (4.5 lbs.) seemed to be much the same as that of a larger bird (7.5 lbs.) It was found that in wooden poultry houses with ventilation at the top the air apparently changed about 4 times per hour. Each bird kept in such a house should, therefore, have 10 or more cu. ft. allotted to it. The number of birds a house will hold depends on its volume and not on the perch room. The maximum number is found by dividing the volume expressed as cu. ft. by 10.

"The greatest capacity can be most economically obtained from a given amount of timber if the house is cubical in shape. This can not be quite realized in practice owing to the necessity for a sloping roof, but the nearer one gets to it the better. Low houses, besides being uneconomical, tend to induce overcrowding. Overcrowding causes diminished egg production, and encourages roup, tuberculosis, and other diseases." It was noted that in a long low house without a floor the air was about twice as good as in a similar house with a floor.

Experiments in fattening turkeys, H. DE COURCY (*Jour. Bd. Agr.* [*London*], *11 (1904), Nos. 7, pp. 385–397; 8, pp. 495, 496, figs. 6, dgms. 2*).—The profitable fattening of turkeys is discussed and a feeding test reported.

Thirty young turkey cockerels of similar breeding which had ranged on stubble fields for about 3 weeks, grain being fed during the latter part of the period, were divided into 3 uniform lots and fed for 3 weeks. The birds weighed on an average 17 lbs. each. During the first 10 days all were fed in the morning a mash of boiled potatoes, boiled turnips, barley meal, maize meal, ground oats, and linseed meal containing 12 per cent of oil, 2:2:2:2:2:1, wet up with skim milk to a rather stiff mash. Milk and water in separate vessels were also supplied, as well as grit and charcoal mixed together. The turkeys were fed in a yard and after an hour for feeding and exercise they were turned into a rather dark poultry house, where they remained until evening, when they were again driven to the yards and fed crushed corn, oats, and barley.

During the latter part of the test this method of feeding was continued with lot 1, which made an average gain during the entire period of 2 lbs. 12 oz. per bird. Lot 2 was fed twice a day by hand cramming a stiff mash of equal parts of ground barley, corn, and oats, with a small amount of melted fat, linseed meal, and skim milk rolled into pellets about 2 in. long and $\frac{3}{4}$ in. in diameter. The average gain for the entire period was 3 lbs. 6 oz. per bird.

The birds in lot 3 were fed with a cramming machine a similar mixture to lot 2 wet up with skim milk to form a slop of about the consistency of cream. The author states that owing to their size and strength some difficulty was at first experienced in feeding the turkeys; "but this slight difficulty was overcome by placing the birds, one at a time, on a low stand, which raised them sufficiently off the ground to bring the head on a level with the nozzle of the cramming machine, and in such a position that the feed could be given quite conveniently. After a day or two the turkeys grew accustomed to this manner of feeding, and when meal times came they showed much eagerness to mount the stand and receive their share of food." In this lot the average gain was 4 lbs. 4 oz. per bird. As will be noted, the greatest gains were made by the turkeys fed the soft mash with a cramming machine. The cost of feed per head ranged from 34 cts. with the lot fed without cramming, to 41 cts. with the lot fed with a cramming machine.

At the close of the test the turkeys were killed and dressed. The author describes briefly the methods in vogue in dressing turkeys for different English markets. Two chief methods of killing are by dislocating the neck and by bleeding. He states that in general the turkeys are plucked but not drawn or trussed. The importance of conforming to the requirements of different markets is spoken of.

Raising and fattening geese for market, H. DE COURCY (*Jour. Bd. Agr. [London], 11 (1904), No. 8, pp. 458–467, figs. 3*).—Geese fattening, especially the system practiced for the Christmas trade in the north of Ireland by a successful goose raiser, is described, and the results of a feeding test with 8 lots of 25 birds each reported.

In 21 days the average gain per bird ranged from 3.24 lbs. with a lot fed in the morning steeped barley, and in the evening distillery-oil cake, barley meal, and bean meal 3:1:1 wet with milk, to 4.4 lbs. with a lot fed steeped oats in the morning and in the evening maize meal, barley meal, boiled potatoes, and linseed meal 2:2:2:1 mixed with milk. The first-mentioned ration was the cheapest and the last-mentioned the most expensive of those tested.

"The process of fattening not only increases the size and weight, but also improves the flavor and texture of the flesh." Killing, plucking, and marketing geese are also spoken of.

The use of self-feeders, H. W. JACKSON (*Nat. Stockman and Farmer, 28 (1904), No. 32, pp. 16, 17*).—Tests are very briefly reported in which the use of self-feeders was compared with the ordinary method of feeding poultry. The data reported show "that in all cases the self-feeder pens have led in number of eggs per hen but generally at a greater cost per dozen, though it is probable that the saving in labor will offset the greater cost. It is also probable that a better understanding of conditions will make it possible to produce eggs in self-feeder pens at a lower relative cost."

The effect of alkalis on the metabolism of hens fed meat, F. BAHRMANN (*Arch. Internat. Pharmacodynamie, 12, No. 5–6, p. 421; abs. in Zentbl. Physiol., 18 (1904), No. 15, pp. 483, 484*).—In connection with experimental studies, with reference to gout, of the effect of adding alkalis to a meat diet, data are recorded regarding the weight of the chickens fed, the food eaten, the income and outgo of nitrogen, and related topics.

The production and preservation of eggs, A. DE VILLÈLE (*Rev. Agr. Réunion, 9 (1903), No. 10, pp. 372–376*).—Data on egg production and preservation are summarized. The author suggests the possibility of the use of molasses as a preservative for eggs.

Ostrich farming, G. H. ODLUM (*Rhodesian Agr. Jour., 1 (1904), No. 6, pp. 180–182, figs. 2*).—General directions are given for raising ostriches and marketing the feathers. The importance of alfalfa pasturage in connection with this industry is spoken of. "In addition to lucern, ostriches may be fed on any green food, such as root crops, cut-up green mealie [Indian corn] stalks, cabbage, etc. Growing birds should also have some grain during the first year, and breeding birds require mealies during the laying period."

Report on cooperative agriculture and rural conditions in Denmark, VISCOUNT IKERRIN, P. J. HANNON, L. J. D'ALTON, and J. J. SLATTERY (*Dept. Agr. and Tech. Inst. Ireland, Bul. 7, 1903, pp. 148, fig. 1*).—Among the subjects included in this report are pig breeding in Denmark, cooperative dairying in Denmark, Danish butter exhibitions, cattle-improvement societies, the egg industry of Denmark, horse-breeding societies, and margarine inspection.

In carrying on their work the cooperative egg societies pay for the eggs by weight, take special pains to secure clean eggs, and keep records which enable them to follow up the matter if stale eggs are found when the eggs which have been collected are graded and packed for shipment. Some data are also given regarding the pickling of eggs in large quantities in limewater when the supply is abundant.

DAIRY FARMING—DAIRYING.

Feeding experiments with milch cows, N. OEDEGAARD (*Tidsskr. Norske Landbr., 11 (1904), No. 4, pp. 141–174*).—*Concentrated feed in mountain dairies.*—The object of the experiments was to determine the economy of feeding grain to cows kept on mountain pastures. Two lots of 5 cows each were selected in two different dairies.

One lot received 1 kg. of concentrated feed in addition to pasture during the months of June to August, 1902, while the other lot received no grain. A majority of the cows had calved prior to the month of January. The results showed no particular effect of the grain feeding.

In another experiment conducted during 1903 with two groups of 10 cows each, spring-calving cows were mainly included. One lot was fed 1 kg. cotton-seed meal in addition to a very small allowance of grain fed to both lots. In this case a direct gain was obtained from the grain feeding, since 370 kg. of concentrated feed apparently produced an increase of 492 kg. of milk. It was also noticed that feeding grain tended to maintain better the milk flow and to improve the body condition of the cows.

Feeding trials with mountain hay.—The trials were planned to determine whether mountain hay exerts any special effect on the fat content of cows' milk. The trials were conducted with 5 cows for 7 periods of 7 to 14 days' duration, and failed to show that mountain hay fed with concentrated feed and either roots or wet distillers' grains, possesses any beneficial influence on the fat content of the milk. Changes in the system of feeding appeared to lower the per cent of fat in the milk for a short period.—F. W. WOLL.

On the relation of milk yield and feed consumption, G. HOLTSMARK (*Arch. Math. og Naturvidensk., 26 (1904), No. 2, pp. 17*).—The author tabulated the average production and feed consumption of 846 Norwegian dairy herds during the year 1902, using the data obtained by the cattle control associations of that country. In the calculation of the amount of feed consumed the various feeds were referred to their supposed equivalents of "food units," according to the common practice of these control associations (see E. S. R., 13, p. 177).

In the study of the relation between the milk yield and feed consumption, the formula for a curve showing the number of food units required for the production of different annual milk yields was obtained by means of a logarithmetic function. The results obtained agree very closely with the yields actually found in the different herds. The following table gives some of the main results of the calculations:

Relation of milk yield and feed consumption.

Number of food units.	Yields of milk.	Yield of milk per 100 food units.	Increase in milk production for each additional 500 food units.
	Kilograms.	*Kilograms.*	*Kilograms.*
1,500	923	61.5	....
2,000	1,424	71.2	501
2,500	1,813	72.5	389
3,000	2,131	71.0	318
3,500	2,399	68.5	268
4,000	2,632	65.8	233
4,500	2,837	63.1	205

The largest yield of milk per 100 food units, 1,743 kg., was obtained by feeding 2,402 food units per year. The figures given in the last column of the table show that the increase in production grows smaller the heavier the cows are fed. The results of the computations are used by the author for studying the system of feeding adopted in different parts of the country and the relations between the prices of milk and feeds and the intensity of the feeding.—F. W. WOLL.

White carrots as a fodder for dairy cattle, J. MAHON (*Queensland Dept. Agr. Rpt. 1903–4, pp. 32, 33*).—In an experiment here reported, 4 cows were kept on natural pasture for a period of 8 days, after which they were fed a daily allowance of about 35 lbs. of carrots per head for a second period of 8 days, following which

they were fed almost exclusively on carrots (60 to 75 lbs. per head daily) for a third period of 8 days. As an additional ration to natural pasturage, the carrots increased the yield of milk, but when the cows were fed almost exclusively on carrots and deprived of pasturage, the yield was diminished.

Experiment on the housing of milk cows in autumn, P. H. FOULKES (*Bd. Agr. and Fisheries [London], Ann. Rpt. Agr. Education and Research, 1903–4, pp. 101–103*).—In an experiment from November 2 to December 7, 1901, 5 cows were stabled each night and fed a small amount of hay, while 5 other cows were turned out on pasture during the night. The experiment was repeated from November 22 to December 13, 1902, and from October 31 to November 28, 1903. During each period extremes of temperature were experienced.

The cows stabled at night produced on the whole less milk than those turned out on pasture. The fat content of the milk was increased during the first experiment by turning out to pasture, while during the second and third experiments there was practically no difference. It is stated that the increase in the live weight of the animals showed that they did not suffer when turned out at night. The extra cost of stabling is estimated at about 31 cts. per head per week, while no estimate is placed upon the value of the pasture.

Variations in the composition of milk and their probable causes, D. A. GILCHRIST ET AL. (*County Councils Cumberland, Durham, and Northumberland, Agr. Dept. Durham Col. Sci. Rpt., 12 (1903), pp. 54–75*).—In 6 localities in Northumberland County the milk of individual cows and the mixed milk of herds were tested and data collected as regards breed of cows, times of milking, weather conditions, and rations fed. In all about 50 cows were tested, the periods varying from 1 month to 1 year, and the tests being made daily, once in 2 weeks, or monthly.

The results indicate that when milking takes place early in the afternoon the morning's milk of a herd may frequently fall below the legal standard of 3 per cent of fat and 8.5 per cent of solids-not-fat. As a remedy a third milking as late as possible in the evening is suggested. Even with nearly equal intervals between milkings the tests show that the milk of a few cows may very frequently fall below the legal standard. In general the considerable changes made in the feeding of the different herds during the progress of the tests did not seem to affect materially the quantity or quality of the milk. In one instance, however, when the cows were pastured, 11 qt. of milk was required to produce 1 lb. of butter, while 9 qt. was sufficient when the cows were fed indoors.

When cows were exposed to cold weather the fat content of the milk was considerably lowered. Cows of a nervous and excitable temperament showed greater variations than those of a more quiet disposition. "When a cow is in season the milk has usually less fat and is less in quantity. It has been noticed in one or two cases that the milk is richer in fat immediately before this time." The importance of regularity in the times of feeding and milking in order to lessen variations is dwelt upon.

The character of milk during the period of heat (œstrum), C. F. DOANE (*Maryland Sta. Bul. 95, pp. 25–30*).—Determinations were made of the total solids, fat, protein, casein, and sugar in the milk of 5 cows before, during, and after the periods of heat. In no case was the percentage of fat lower than normal during the period of heat, and in only two instances was there any increase. No variations were observed in the other constituents, nor in the temperature of the cows.

"From these results, and as far as chemical analyses show, it would seem that the milk from cows during the period of heat is in a practically normal condition and fit for consumption." The possibility of the milk containing some abnormal constituent during the period of heat is, however, mentioned.

Systems for keeping milk and butter records, C. F. DOANE (*Maryland Sta. Bul. 94, pp. 22, figs. 3*).—The author points out the advantages of keeping dairy records, and describes and illustrates practical methods for this purpose.

A portion of the bulletin is devoted to a discussion of the possibility of obtaining an approximately average test of the performance of cows by testing only once, twice, or three times during the lactation period. It is considered obvious that one test made during the first month could not be depended upon, and that tests made during the second and third months would usually be lower and during the last 3 months higher than the average yearly test.

In order to determine if one test made near the middle of a lactation period, or if a combination of tests for 2 or 3 months would give reliable results, a table was prepared showing the variations of the monthly tests from the average yearly tests for 22 cows of the station herd during 1 to 4 lactation periods. The monthly tests were made from a composite sample representing the night and morning's milk for from 5 to 7 days. The average monthly variations from the yearly tests were as follows: Second month −0.14, third month −0.06, fourth month −0.008, fifth month −0.01, sixth month +0.008, seventh month +0.01, eighth month +0.08, ninth month +0.2. Combinations of the third and eighth months and of the second and eighth months varied, respectively, +0.01 and +0.03.

Combinations of the fourth and seventh months, of the second, fifth, and ninth months, and of the third, sixth, and eighth months corresponded with the yearly average. The author believes "a system for testing that can be depended on to give an average within 0.4 per cent of the actual yearly average in all, or nearly all, cases is sufficiently accurate for practical purposes."

As regards the single test, the average results for any month between the second and ninth come within the limit of variation assumed as allowable. A consideration of the individual records, however, shows many variations greater than 0.4. On the whole the seventh month gave the best results, though it is considered evident that where a cow comes near the line of profit or loss a single test can not be depended upon for furnishing an accurate basis for judging her value. Where 2 tests were made the best results were obtained by combining the third and eighth months. A combination of the second, fifth, and ninth months showed, according to the author, but one serious variation and that was considered due to an abnormal test. A combination of the third, sixth, and eighth months showed no serious variation. Either of these two combinations is considered as insuring results that can be depended upon as giving a fair basis for estimating the value of a cow.

Milking cows by electricity, S. P. WARNER (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., No. 286 p. 147*).—A consular report referring briefly to a newly invented electrical apparatus claimed to be more effective than milking by hand and also to insure absolute cleanliness.

The milking trials of 1903, F. J. LLOYD (*Jour. British Dairy Farmers' Assoc., 18 (1904), pp. 95–121*).—Two-day tests of 63 cows, made at the dairy show of the British Dairy Farmers' Association of 1903, are reported in detail, and the data furnished for such tests made during a series of years are arranged by breeds and summarized in the following table.

Quantity and quality of milk in two-day tests of different breeds.

Breed.	Year.	Number of cows.	Yield of milk.	Fat content of milk.	Solids-not-fat.	Total solids.
			Pounds.	*Per cent.*	*Per cent.*	*Per cent.*
Shorthorns	1899	24	46.0	3.74	9.04	12.78
Do	1900	26	48.1	3.54	8.83	12.37
Do	1901	18	52.2	3.53	8.96	12.49
Do	1902	34	46.9	3.86	8.88	12.74
Do	1903	19	54.1	3.79	8.89	12.68
Jerseys	1899	20	31.9	5.17	9.34	14.51
Do	1900	25	31.0	5.11	9.22	14.33
Do	1901	24	28.7	5.35	9.34	14.69
Do	1902	30	30.6	5.01	9.24	14.25
Do	1903	18	31.5	5.39	9.00	14.39
Guernseys	1899	6	28.9	4.43	9.29	13.72
Do	1900	10	33.2	4.69	9.18	13.87
Do	1901	11	32.8	4.31	9.19	13.50
Do	1902	2	30.2	5.01	8.84	13.85
Do	1903	6	29.2	4.37	9.03	13.40
Red Polls	1899	7	41.8	3.39	8.84	12.23
Do	1900	8	40.8	3.65	9.10	12.75
Do	1901	4	45.7	3.47	9.18	12.65
Do	1902	7	39.2	3.68	9.01	12.69
Do	1903	7	39.3	3.60	8.89	12.49
Kerries	1899	8	36.1	3.33	8.86	12.19
Do	1900	12	25.7	4.33	9.21	13.54
Do	1901	7	33.5	3.69	9.07	12.76
Do	1902	10	27.2	4.36	9.23	13.59
Do	1903	4	35.1	3.95	9.06	13.01
Crosses	1899	9	51.7	3.76	9.08	12.84
Do	1900	8	43.6	3.88	8.94	12.82
Do	1901	5	42.2	3.65	8.94	12.49
Do	1902	13	42.7	3.97	9.05	13.02
Do	1903	13	43.9	3.86	8.85	12.71

Dairy-herd records, J. Mahon (*Queensland Dept. Agr. Rpt. 1903–4, p. 31*).—Records for one lactation period are given of 31 cows, representing 10 breeds.

Scales of points for judging cattle of dairy breeds, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 48, pp. 14, fig. 1*).—This circular, which is a revision of Circular 27 of the Bureau (E. S. R., 12, p. 90), contains the latest authorized forms of the scales of points in use for judging cattle of the several breeds especially adapted to the dairy.

The milk supply of Porto Rico together with directions for its analysis and some precautions to be taken in its preservation, W. N. Berkeley (*Office Health, Charities and Corrections [Porto Rico], Chem. Lab. Bol. 1, pp. 25*).—Analyses of 1,970 samples of milk made during 1900 and 1903 showed that the adulteration of milk by the addition of water is extensively practiced in certain districts in Porto Rico.

Average composition of Essex milk, T. S. Dymond and F. Hughes (*Essex Education Com., Notes Agr. Anal. County Tech. Labs., 1901–3, pp. 27–29*).—Of 85 samples of milk analyzed, 16 were below the standard of 3 per cent of fat and 6 below that of 8.5 per cent of solids-not-fat, and 1 below in both. Excluding 5 samples as undoubtedly adulterated, the remaining samples averaged, specific gravity, 1.032 per cent; fat, 3.7 per cent; and solids-not-fat, 8.9 per cent.

Contribution to the knowledge of buffalo milk, R. Windisch (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 5, pp. 273–278*).—Earlier work on this subject is reported briefly, and the results of analyses of the milk of 3 buffalo cows made by the author during the summer of 1902 are given. The following average, maximum, and minimum figures were obtained:

Composition of buffalo milk.

	Number of determinations.	Averages.		Minima.	Maxima.
		Morning's milk.	Evening's milk.		
Total solids, per cent	42	20.12	18.83	14.47	21.86
Fat (Gerber), per cent	71	9.20	7.69	....	....
Fat (Liebermann and Szekely), per cent	72	9.34	7.87	4.90	10.63
Ash, per cent	42	.775	.831	.705	1.041
Specific gravity of milk	77	1.03105	1.03265	.0229	.0398
Specific gravity of serum	64	1.0319	1.0325	.0290	.0351

—F. W. WOLL.

The acidity of cows' milk, R. HANNE (*Milch Ztg., 33 (1904), Nos. 42, pp. 659, 660; 43, p. 679; 44, pp. 709–711; 45, pp. 725–727*).—The author gives an historical sketch of the subject and of methods for the determination of the acidity of milk. An addition of formaldehyde to the milk caused an increase in acidity beyond that accounted for by the acid reaction of the formaldehyde.

A large number of determinations of the acidity of milk of 19 cows of different breeds were made throughout a lactation period, the results of which are given in the article. Fresh milk from the same cows was found to vary considerably in acidity from day to day; in most cases a maximum acidity occurred at the beginning of the lactation, and a minimum acidity toward the end. Some cows gave highest results one or more months after calving, however, and others again did not show any regular change in the results obtained one way or the other. No parallelism was found between the acidity of the milk of different cows or of the same cows at different stages of the lactation, and the total solids, the fat, or the ash contents of the milk, while the percentage of phosphoric acid in the ash, in the majority of cases, rose or fell with the degree of acidity of the milk.

A smaller phosphoric-acid content has been found in the milk at the end than at the beginning of the lactation period by various authors (Andouard, Schrott, and Hansen). By deducting the phosphoric acid combined with casein from the total phosphoric acid in the ash of the milk, the difference was found to correspond closely to the degree of acidity in the milk. Of the other acids in the milk, carbonic acid exerts only a slight influence on the acidity, while citric acid (as sodium citrate) is of more importance.

The acidity of milk and of serum obtained therefrom (as well as that of the casein determined by difference) was studied, and considerable variations were found in either case for milk of the same cows. The acidity of fresh milk, according to the author's findings, is due to the acid phosphates, most likely first of all to calcium phosphate, and stands in close relation to the albuminoids of the milk, mainly casein. The influence of the feed, breed, age of cows, œstrum, sickness, etc., upon the acidity was also studied by the author, and the results briefly discussed in the article. The average acidity in fresh milk found by the author was 8.75° Soxhlet (average of 1,671 determinations).—F. W. WOLL.

Report of the dairy inspector, S. J. BENTERUD (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1903, I, Statsforanstalt., pp. 321–331*).—The author continued the investigations of Ramstad (E. S. R., 12, p. 590) concerning the composition and yield of milk from cows in Norwegian mountain dairies (Sätre). Examinations were made of the milk produced by 99 cows in 11 different dairies. The results obtained by the author do not indicate that cows fed best during the winter give the richest milk, but rather that they give an even and regular flow of milk of a more uniform fat content than is the case with cows fed poorly during the winter months.—F. W. WOLL.

On the dairy control associations of Norway, H. ISAACHSEN (*Tidsskr. Norske Landbr., 10 (1903), No. 11, pp. 496–528*).—An historical sketch and a criticism of the work of the associations, especially as regards the data obtained for economy of production.—F. W. WOLL.

On the milk supply of cities, especially of Christiania, S. J. BENTERUD (*Tidsskr. Norske Landbr., 10 (1903), Nos. 10, pp. 455–473; 11, pp. 487–495*).

The source and nature of bacteria in milk, D. H. BERGEY (*Pennsylvania Dept. Agr. Bul. 125, pp. 40*).—The investigations reported in detail in this bulletin relate to the number and nature of the bacteria in fresh milk, the nature and source of bacteria gaining access to milk in the ordinary manipulations following milking, the occurrence and significance of leucocytes or pus cells in milk, the occurrence and significance of streptococci in milk, and the relation of the streptococci found to those encountered in several diseases of man and animals. The methods employed are briefly described and the results are presented in a series of tables. The author summarizes the results of his investigations as follows:

"(1) In the samples of milk drawn directly from the udder the number of bacteria found ranged from none (in 32 per cent of the samples) to 93,100 per cubic centimeter. The prevailing bacteria found in these samples are streptococcus, staphylococcus, and *Bacillus pseudodiphtheriæ*. Other bacteria were also found in limited numbers in some of the samples and they were no doubt derived from the orifice of the teat, the hands of the milker, the hair of the cow, or the air of the stables and laboratory.

"(2) The bacteria which gain access to milk in modern dairies during the manipulations of the milk in milking, straining, and cooling, are evidently derived from several sources, as the air of stables and milk houses, the hair of the animal, and from the different milk utensils, the latter being by far the most fruitful source of the bacteria.

"The bacteria gaining access to milk in the ordinary manipulations in modern dairies are largely air, water, and soil organisms, as shown by the preponderance of organisms of the type of putrefactive bacteria. The occurrence of the group of lactic bacteria in such milk was found to be quite insignificant, though it is probable that these organisms find in milk a more suitable field of activity than do the putrefactive bacteria and, hence, usually exceed them in numbers by the time the milk reaches the consumer.

"The occurrence of *Bacillus coli* and *B. alkaligenes* in these samples of milk indicates contamination with manure, though these bacteria may gain access to the milk in an indirect manner by being carried in the air or by flies.

"(3) Cells can be demonstrated in the milk of practically all cows, and hence the number of these cells present in milk becomes a matter of importance. It is believed that the occurrence of 10 cells per field of the $\frac{1}{12}$ immersion lens indicates the presence of pus in milk, especially if the cells occur in masses. The presence of pus in milk always denotes an inflammatory reaction within the udder, from the fact that the pus is always associated with pyrogenic organisms.

"(4) Streptococci were found in nearly all the samples of milk, derived from cows which showed the presence of pus. These bacteria are usually the cause of catarrhal mammitis, and are always encountered in the contagious mammitis.

"Streptococci and pus cells were also encountered in samples of milk derived from cows in which no inflammation of the udder could be discovered. This occurrence is probably due to the fact that the disease was not very active or that it had persisted for a considerable time and become chronic.

"(5) Comparative studies of the different cultures of streptococci isolated from milk revealed no marked morphologic or biologic differences. Neither could these cultures be differentiated by this means from cultures of streptococci isolated from pathological conditions in man.

"The immunization of several goats with cultures of streptococci isolated from milk and from pathological conditions in man failed to show any definite differences in the agglutinating power of the different sera against the various cultures of streptococci, whether these were of human or of bovine origin."

The bacteria in the udder of cows and the manner in which they are distributed in the different portions of the milking, E. von Freudenreich (*Rev. Gén. Lait, 3 (1904), Nos. 18, pp. 416–425, pl. 1; 19, pp. 440–448; 20, pp. 462–473; 21, pp. 492–496; Ann. Agr. Suisse, 5 (1904), No. 4, pp. 121–149; Landw. Jahrb. Schweiz, 18 (1904), No. 9, pp. 407–433; Centbl. Bakt. u. Par., 2. Abt., 13 (1904), Nos. 9–12, pp. 281–291; 13–14, pp. 407–427*).—Experiments to determine the way in which bacteria gain entrance to the udder are reported. The bacteriological analyses of a large number of samples of milk from different cows taken at varying times during the milking process are given. It was found that the number of organisms decreases as the milking proceeds. In a few cases the strippings contained more than the fore milk. The author thinks this is due to a drop of liquid having fallen from the hand of the milker, as milking was done with wet hands. Such sudden increases in number were not obtained when the milking was done with dry hands.

Liquefying and nonliquefying micrococci were the most numerous. Lactic-acid forms were found only occasionally except in the case of one animal, whose milk, strippings as well as fore milk, contained large numbers. Cows were fed cultures of *Bacillus prodigiosus* and distillery slops and the milk examined for the presence of the germs contained in the slops. The results were negative.

The author thinks that his results can not be construed to favor the idea of an infection of the udder by the way of the blood or lymph, at least under normal conditions, but that they seem to point toward the invasion taking place by way of the external openings of the teats.—F. W. WOLL.

A lactic-acid bacterium which liquefies gelatin, F. W. J. Boekhout and J. J. Ott de Vries (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 19–21, pp. 587–590*).—The authors separated a diplococcus from an American Cheddar cheese, which formed considerable quantities of lactic acid, and also contained a proteolytic and a rennet-like enzym. In how far this bacterium as such, or through its enzyms, is of importance in the curing of cheese the authors do not discuss, further than stating that it appears to them that it is the main cause, being always present in such cheese.—F. W. WOLL.

The action of various classes of bacteria on casein as shown by milk-agar plates, E. G. Hastings (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 19–21, pp. 590–592*).—The formation of soluble peptones by liquefying bacteria, and of casein monolactate by lactic-acid bacteria, may be graphically demonstrated by milk-agar plate cultures inoculated with the appropriate organisms.—F. W. WOLL.

Comparative investigations on the content of proteolytic and amylolytic enzyms in different kinds of milk, A. Zaitschek and F. von Szontagh (*Arch. Physiol. [Pflüger], 104 (1904), No. 9–12, pp. 539–549*).—In no instance in these investigations was peptone, pepsin, trypsin, or a glycolytic ferment found in human milk or in the milk of the cow, ass, mare, goat, and buffalo. On the contrary, in fresh samples, a diastatic ferment was invariably met with. The tests employed are described and some discussion of the literature is included.

Homogenization in the industries, A. Burr (*Milch Ztg., 33 (1904), No. 41, p. 643*).—A brief description of 3 methods of "homogenization" of milk (rendering fat globules of uniform minute size through pressure), for infant feeding and for export, and also of similar treatment of substances entering into the manufacture of oleomargarine.—F. W. WOLL.

New milk powders, C. Knoch (*Milch Ztg., 33 (1904), Nos. 44, pp. 694–697; 45, pp. 707–709; 46, pp. 723–725*).—A general discussion of the subject, with illustrated description of apparatus.—F. W. WOLL.

On the causes of foaming of milk in separator skimming, J. Siedel and A. Hesse (*Molk. Ztg., 18 (1904), Nos. 36, pp. 851, 852; 37, pp. 879, 880*).—The results of experiments made by the authors are given in the article, showing that foaming of the milk is caused mainly by small amounts of casein dissolved by the lactic acid and by the milk sugar in the milk.

Between 30 and 50° C., at least, foaming increases with increasing temperatures. Milk containing similar amounts of total solids, milk sugar, and nitrogenous substances may give different amounts of foam in separating, according to the interval that has elapsed since milking and the care with which the milk has been handled.—F. W. WOLL.

Cream-thickening substances, F. Reisz (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 10, pp. 605–607*).—Two substances of similar chemical composition were sold on the Berlin milk market for use in thickening heated cream, viz, Grossin and a lime-sugar solution. Chemical analyses showed both to contain 10.5 per cent of cane sugar and 5.6 per cent of lime per 100 cc. They are, therefore, identical with the so-called viscogen (sucrate of lime) devised by Babcock and Russell for restoring the viscosity of pasteurized cream (E. S. R., 9, p. 181). The author argues against the use of these substances in cream or milk.—F. W. WOLL.

Taylor's absorption process for butter making (*Jour. Franklin Inst., 158 (1904), No. 3, pp. 233–235*).—The committee of the Franklin Institute having under investigation the merits of the Taylor butter-making process reports that this process is a simple and inexpensive means of separating rapidly the fatty portion of sweet cream from the watery portion.

The watery portion is absorbed by heavy sheets of blotting paper supported upon absorptive material like Turkish toweling. The watery constituents pass readily through the blotting paper and are taken up by the absorptive pads, while the fatty portion forms a layer on the surface and may be removed, and salted and worked like ordinary churned butter. It is stated that patents have been granted in the United States, Canada, England, France, and Germany for this process. The committee reports that an analysis of this fatty layer showed 79.49 per cent of fat and 2.55 per cent of casein, and that the fatty layer is very palatable when fresh but does not keep well unless salted and worked.

An analysis of the salted and worked butter showed 82.95 per cent of fat and 1.15 per cent of casein, and a Reichert-Meissl number of 30.31. The John Scott Legacy Medal and Premium was awarded the inventor.

A new method of making butter, F. J. Lloyd (*Jour. British Dairy Farmers' Assoc., 18 (1904), pp. 136–139*).—Instead of using water for washing butter, the author used separator skim milk which had been twice pasteurized. Salted and unsalted samples prepared in this manner contained, respectively, 11.35 and 13.14 per cent of water, the former containing only ½ as many bacteria. The author considers that the results are sufficiently interesting to warrant his calling the attention of butter makers who have a poor water supply to this simple method of overcoming the difficulty, and states that the experiments are being repeated at the British Dairy Institute.

The butter tests of 1903, W. C. Brown (*Jour. British Dairy Farmers' Assoc., 18 (1904), pp. 122–135*).—Two-days tests of 59 cows, on the average, have been made at the dairy show each year for 8 years. Summarized data for this period and more detailed data for 1903 are given in this article.

Average differences between the yields of butter as determined by churning tests and the yields of fat as determined from analyses are also tabulated.

Investigations of Dutch butter, Groszmann and Meinhard (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 4, pp. 237–243*).—The authors refer to Van Rijn's examination of Dutch butter (E. S. R., 14, p. 81), and maintain that Dutch exporters of oleomargarine have taken advantage of the low results for Reichert-Meissl

numbers of pure butter published by this investigator, and have sold butter containing as much as 30 per cent of foreign fats as pure.

They recommend that the Reichert number should be supplemented by other methods of examination in pronouncing upon the purity of butter, viz, the refractometer, saponification, and iodin numbers, Juckenack's method of determining the molecular weight of the nonvolatile fatty acids (E. S. R., 16, p. 332), and Bömer's phytosterin acetate method for the determination of the presence of vegetable fats. A number of pure commercial samples of butter, as well as of adulterated butter, were examined by the authors, the results being given in the paper.—F. W. WOLL.

On the value of the Reichert-Meissl number in butter analysis, M. SIEGFELD (*Molk. Ztg., 18 (1904), No. 21, pp. 481–483*).—The results of determinations of the Reichert number of butter in 2 Ost-Friesian creameries for 4 and 5 years, respectively, and of that produced in 7 other creameries for 2 years each are given in this paper. On account of the time of calving, coming in general in the spring, in the region in which the creameries are located, the Reichert numbers obtained were highest in the spring and lowest in the fall, going repeatedly down to 21 and 20, and once, in November, even to 19.9. The author warns against a too rigid interpretation of the Reichert number as indication or proof of the purity of samples of butter.—F. W. WOLL.

A case of abnormal butter, A. REINSCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, pp. 505–508*).—The article gives the results of the analysis of a sample of butter fat obtained from the milk of five Holstein cows in good health, fed 6 to 8 lbs. potato pulp and ¾ to 1 lb. rice polish per head daily, besides pasture. The refractometer number of the fat was – 2.5, the Reichert-Meissl number 19.7, saponification number 213.9, molecular weight of the nonvolatile acids 269.2, new butter number (Polenske) 1.3. No reaction for sesame oil was obtained. The high molecular weight of the insoluble fatty acids accompanying the low Reichert number is especially noteworthy.—F. W. WOLL.

Report on Swedish butter exhibits, 1903, N. ENGSTRÖM (*Meddel. K. Landtbr. Styr. [Sweden], 1904, No. 92, pp. 69*).—The report contains the usual summary of the scorings of the tubs of butter exhibited by Swedish creameries during the year 1903, and also the proceedings of the annual meeting for the award of prizes.

Papers on the following subjects were read at this meeting: A Trade-mark for Swedish Export Butter, by N. Engström; On County Butter Exhibits and Their Relation to the State Exhibits, by G. Liljhagen; Some Causes of Lack of Uniformity in Butter, by N. Landberg; What Importance has Thorough Cooling for the Quality of Butter, and How May It Best be Obtained, by E. Waller; A Uniform Net Weight for Export Butter, by P. Rundgren.

The results of analyses of skim milk and buttermilk from Swedish creameries during 1903 are given at the close of the report. The average fat content of skim milk from pasteurized milk (409 samples) was 0.11 per cent and from raw milk (517 samples) 0.13 per cent; the average per cent of fat in the buttermilk (301 samples) was 0.55 per cent, practically the same fat content being obtained in the case of buttermilk from pasteurized and from raw milk. The total loss of fat in the skim milk and the buttermilk per 100 kg. milk was 145 gm. and 164 gm., for pasteurized and raw milk, respectively.—F. W. WOLL.

A review of the dairy industry, M. A. O'CALLAGHAN (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 866–880*).—This article contains statistics on the exportation of butter from New South Wales, and numerous suggestions regarding the improvement of the dairy industry in that country and the shipment of dairy products. The butter shipped to England during the year ended June 30, 1904, exceeded 15,000,000 lbs.

Examination of a sample of oleomargarine containing ammonia, K. FISCHER and O. GRÜNERT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, pp. 414–416*).—The ammonia present, amounting to 0.017 gm. in 100 gm., apparently

came from some substance added in the process of manufacture, probably carbonate of ammonia, because of the use of the oleomargarine in pastry making.—F. W. WOLL.

Parchment paper containing boric acid, K. FISCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, p. 417*).—Only 17 samples of parchment paper out of a total of 124 samples examined by the author were found entirely free from boric acid or borates. One hundred and one samples gave a strong reaction and 6 samples a faint reaction for boric acid.

Four samples examined quantitatively contained from 0.384 to 1.130 gm. of boric acid per 100 gm. of paper. It is shown that parchment paper of this kind may contaminate oleomargarine (or butter) which is wrapped therein to such an extent that the outside layers of the same will give a decided reaction for boric acid.—F. W. WOLL.

The relation of bacteria to the flavors of Cheddar cheese, L. A. ROGERS (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 62, pp. 38, fig. 1*).—The physical and chemical changes taking place in the ripening of cheese and the causes of these changes are discussed and concisely summarized. The appended bibliography furnishes references to 21 articles used in this review. In addition considerable experimental work is reported, the results of which are stated briefly by the author in his summary of the bulletin as follows:

"In this paper are given the results of bacteriological investigations made on three pairs of duplicate cheeses; one cheese of each pair was held at a low temperature (8 to 12° C.) and one at a comparatively high temperature (23° C.). In all cases the high-temperature cheeses ripened rapidly and soon developed a strong overripe flavor, while the low-temperature cheeses ripened slowly and retained an agreeable flavor for a long time. The bacteria in the high-temperature cheeses decreased rapidly, and before the cheeses were thoroughly ripened had reached unimportant numbers. The increase in amids and ammonia continued after the bacteria had nearly disappeared. In the low-temperature cheeses the decrease of the bacteria was slower and more gradual, but continued until the number present was comparatively small. There was no increase in bacteria in any cheese at any time.

"The total bacteria was made up almost entirely of bacteria of the lactic class. In one pair of cheeses, at least, this included a lactic-acid-forming bacterium, liquefying gelatin very slowly and bringing about a slight proteolysis of casein in milk if the acid was neutralized. Gelatin-liquefying bacteria were present during the first few days of the ripening in considerable numbers; after a rapid initial decline they persisted in comparatively small numbers, but in the course of time usually disappeared almost entirely. In all cases the high initial number was made up almost entirely of a coccus forming on gelatin small, round colonies with a saucer-shaped liquefaction. There was no differentiation, qualitative or quantitative, in the bacteria that could account for the marked differences which existed between the high and the low temperature cheeses.

"Autodigestions of these cheeses at different periods of the ripening, made in a way that excluded the action of organisms without inhibiting the activity of the enzyms, indicated that—

"(1) In the fresh cheeses bacterial enzyms were present in amounts sufficient to produce only a slight increase in the amids and ammonia.

"(2) In the ripe cheeses bacterial enzyms were present in quantities sufficient to produce a marked increase in amids and ammonia. This was true of all the cheeses.

"(3) Bacterial enzyms were formed at an earlier period and in greater quantity in the high-temperature cheeses than in the cheeses ripened at a low temperature.

"Certain of the liquefying bacteria were able to secrete proteolytic enzyms, which, when added to sterile water suspensions of cheese, caused a marked increase in the amids and ammonia. A lactic-acid bacterium which was able to digest neutralized

milk did not secrete, under these conditions, sufficient enzym to change appreciably the amount of soluble nitrogenous constituents of cheese extract."

Report of investigations into some faulty dairy produce, T. A. Coward (*Univ. Leeds and Yorkshire Council Agr. Ed.* [*Pamphlets*] *41, 1904, pp. 12; 42, 1904, pp. 8; abs. in Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 6, pp. 364–367*).—Report No. 41 is a technical account and No. 42 a more popular account of investigations concerning slimy and greasy cheese, dirty-looking or gray spots throughout the interior of cheese accompanied by a more or less soapy flavor, and a tainted or off-flavored butter.

From the slimy exterior of cheese 10 micro-organisms were isolated, the following 6 of which were believed to be instrumental in causing the trouble: A gray mold (*Mucor mucedo*); a chocolate-colored mold, probably a species of Chætomium; an orange color-producing micro-organism (*Micrococcus olens*); a greenish-yellow, color-producing micro-organism (*M. mucilaginosus* var. *chlorinus*); a pink color-producing micro-organism (*M. carnicolor*); and a brown color-producing micro-organism (*Bacterium brunneum* or *Bacillus brunneus*).

The characteristics of these micro-organisms, as observed in pure cultures, are described and their probable order of appearance is discussed. As a means of prevention the application of a solution of borax or of powdered borax is recommended. The removal of the slime caused by the mold and chromogenic bacteria may be accomplished by the application of small quantities of methylated spirits.

The flora of a faulty cheese was found to include, among other organisms, *Mucor erectus* and putrefying bacteria, which were considered responsible for the bad flavor and gray spots. The source of the putrefying bacteria was believed to be the feeding cakes used.

The tainted flavor in butter was believed to be due to a putrefying bacterium and a species of Sarcina, and the sharp penetrating odor due to an acid-producing bacillus of the lactic-acid type. It was found that neither of the bacteria producing the bad flavor produced more than a trace of free lactic acid, hence the immediate and rapid acidification of the cream would retard or prevent the development of these micro-organisms when present. The species of Sarcina resembling *Sarcina flava* was found in sour paste.

On discoloration of cheese by metals, especially by copper, M. Siegfeld (*Molk. Ztg., 18* (*1904*), *No. 30, pp. 705–707*).—A supplementary article to a previous paper by the author on this subject (E. S. R., 14, p. 489), giving a number of references and methods of examination of cheese for heavy metals.—F. W. WOLL.

United States and State standards for dairy products, 1904 (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 49, pp. 2*).—Standards for dairy products as proclaimed by the Secretary of Agriculture and as established by law in the several States are given in tabular form.

The application of refrigerating machinery to modern dairy practice, L. M. Douglas (*Jour. British Dairy Farmers' Assoc., 18* (*1904*), *pp. 23–36*).—A general presentation of this subject.

VETERINARY SCIENCE AND PRACTICE.

Handbook of pathogenic micro-organisms, W. Kolle and A. Wassermann (*Handbuch der pathogenen Mikroorganismen. Jena: Gustav Fischer, 1903, vol. 1, pp. IV+1045, pls. 3, figs. 376; 1903, vol. 2, pp. 951, pl. 1, figs. 60; 1903, vol. 3, pp. 941, pl. 1, figs. 50; 1904, vol. 4, pp. 1354, pl. 1, figs. 14*).—This treatise is the largest and most elaborate one in existence concerning the morphology and biology of pathogenic micro-organisms as a whole, including bacteria, fungi, and protozoa. The 4 volumes, which constitute a series, are edited by Professors Kolle and Wassermann,

and contain special articles by a large number of well-known authorities on various subjects.

Volume 1 contains a general account of the historical development of the doctrine of infection, immunity, and prophylaxis together with a discussion of the general morphology and biology of pathogenic micro-organisms, nature of infection, mixed infection, bacterial toxins, transmission of infectious diseases, bacteriological methods, lower pathogenic fungi, malarial parasites, hemoglobinuria of cattle, and pathogenic protozoa. Volume 2 is occupied with exhaustive accounts of anthrax, tuberculosis, fowl cholera, hemorrhagic septicemia, tetanus, blackleg, malignant edema, braxy, glanders, actinomycosis, and various diseases which chiefly affect man.

Volume 3 includes discussions of swine plague, hog cholera, swine erysipelas, pleuro-pneumonia, contagious coryza, mouse typhoid, pseudotuberculosis, calf dysentery, infectious abortion, infectious vaginitis, fowl plague, and numerous related human diseases. Volume 4 contains a general discussion of the prophylaxis of infectious diseases, disinfection, natural immunity, protective vaccination, theories of immunity, antitoxic and bactericidal sera, specific precipitins, agglutinins, and special accounts of the methods of producing immunity in a large number of diseases of man and animals.

Hemagglutinins, A. Bexheft (*Arch. Physiol.* [*Pflüger*], *104* (*1904*), *No. 3-4, pp. 235-242*).—A brief review is given of the literature relating to this subject. The author conducted a number of experiments with normal blood serum from cattle and swine. During these experiments it was found that by using the proper quantity of swine blood all substances which agglutinated blood corpuscles of hogs could be removed from normal blood serum of cattle. This removal of the hemagglutinins from cattle-blood serum requires uniformly the same quantity of swine blood.

It was found impossible by means of physiological salt solution to extract from the agglutinated swine-blood corpuscles hemagglutinins which would in turn agglutinate fresh hog corpuscles. From these results it is concluded that in normal cattle-blood serum there exists a special substance which has the power of agglutinating the blood corpuscles of hogs, and that this substance becomes chemically combined with the red blood corpuscles of swine, otherwise it could be again extracted by means of a physiological salt solution.

Influences of ingestion of bacteria and bacterial products on the properties of blood serum, A. Tchitchkine (*Ann. Inst. Pasteur, 18* (*1904*), *No. 9, pp. 576-586*).—The literature relating to this subject is briefly reviewed. The author's experiments were made on adult and young rabbits. The rabbits were fed bran and green herbage in summer and bran with carrots in winter. In order to change the bacterial contents of the intestines as far as possible mixtures of milk and bran were fed. After accustoming the rabbits to the conditions of the experiments they were fed various quantities of typhoid bacilli with their ordinary rations.

It was found during these experiments that the serum of adult, normal rabbits as well as that of young rabbits frequently possesses feeble agglutinating properties toward the typhoid bacillus. No disease resembling typhoid can be produced in rabbits by feeding them typhoid bacilli. The ingestion of large quantities of these organisms, however, influences to a considerable extent the properties of the blood serum. The presence of agglutinins and precipitins is noted after such treatment. The serum then possesses considerable preventive properties as regards typhoid fever. The ingestion of typhoid bacilli killed by heat gives similar results, but the changes in the blood serum are less pronounced.

The further differentiation of flagellar and somatic agglutinins, H. G. Beyer and A. L. Reagh (*Jour. Med. Research, 12* (*1904*), *No. 3, pp. 313-328*).—Experiments were carried out by the authors in attempting to determine any possible differences between the agglutinins obtained from the flagella and the bodies of typhoid and hog-cholera bacilli. Rabbits were used as experimental animals.

In these experiments it was found that the flagellar and somatic agglutinins and other agglutinable substances of the hog-cholera bacillus may be successfully differentiated by the application of heat. The somatic agglutinin of the serum and the flagellar agglutinable substance of the hog-cholera bacillus are considerably influenced by exposure to a temperature of 70° C. for a period of 20 minutes.

A somewhat higher temperature is required in differentiating the flagellar and somatic bodies of the hog-cholera bacillus than is necessary for separating the same bodies in the typhoid bacillus. While a temperature of 70° C. is sufficient to destroy the agglutinating power of motile hog-cholera bacilli, this degree of heat does not affect their power of producing flagellar agglutinins in the animal body.

General pathology of domesticated animals, C. Cadéac (*Pathologie général des animaux domestiques. Paris: J. B. Baillière & Sons, 1904, 2. ed., pp. X+432, figs. 37*).—In this volume, which constitutes the first of a series under the title of veterinary encyclopedia, various matters concerned with the general pathology of animals are discussed.

The subjects treated in the volume include the definition of disease in general; the influence of heredity, age, constitution, and other properties of the organism upon the course of the disease, and also the influence of environment, animal parasites, and bacteria upon the production of disease. A general discussion is also presented of symptomatology and functional disturbances.

Report of the veterinary department of the Minnesota State Board of Health, 1903, S. D. Brimhall, F. F. Wesbrook, and H. M. Bracken (*St. Paul: Pioneer Press Co., 1903, pp. 404, pls. 15*).—This report covers the veterinary work of the Minnesota State Board of Health from August 1, 1900, to May 1, 1903. During this period detailed experimental studies and observations were made on a considerable variety of animal diseases. Copies are given of recent laws in Minnesota regarding the control of animal diseases.

Bovine tuberculosis was studied in some detail (pp. 26–54). As a result of the extensive application of tuberculin tests to dairies it is suggested that compulsory testing of dairy herds would be continued only on condition that some means be provided by which dairymen may replenish their herds with tested cattle, and that no dairyman be permitted to sell milk from a herd containing any untested cows. Glanders received considerable attention from the State board of health (pp. 54–61). Attention was called to the insidious nature of glanders and the danger of infection of other horses as well as human attendants from the presence of one glanderous animal.

In a study of hog cholera (pp. 62–82) many data were obtained regarding the conditions under which this disease prevails most extensively. In certain cases of this disease it was found possible to isolate *Bacillus suisepticus* from the lungs and spleen, and *B. choleræ suis* and *B. coli communis* from the spleen, as well as *B. coli communis* from the kidneys. It is concluded from a study of this disease that the association of swine plague and hog cholera bacilli is of common occurrence, and that swine plague bacilli may be the only organism demonstrable in the initial stages of some cases. In one case hog cholera bacilli were found in salted pork which caused severe digestive disturbances in human beings. Notes are also given on trichinosis (pp. 83–85) and various hog diseases of uncertain origin (pp. 86–88).

Hemorrhagic septicemia in cattle receives a thorough consideration (pp. 89–115). The authors investigated 91 outbreaks of this disease in cattle in a number of herds including 2,850 animals. The mortality was above 95 per cent. The chief lesions as shown post-mortem, are small and large hemorrhagic areas in the subcutaneous tissues, muscles, and throughout the internal organs. From cases of the disease *B. bovisepticus* was isolated and was shown to be pathogenic for rabbits and cattle. In controlling the disease no medicinal treatment is of avail. The dead animals must

be destroyed and diseased ones isolated. Brief notes are also given on anthrax, blackleg, actinomycosis, malignant catarrh, and other diseases of cattle (pp. 116–141).

Meningitis in horses, cattle, sheep, and hogs was studied quite extensively (pp. 142–171). As a result of this investigation no significant lesions were found in any of the animals except in the central nervous system. The meninges of both the spinal cord and brain were uniformly congested. In 9 horses which were examined bacteriologically, the diplococcus of pneumonia was found in considerable abundance. There seems to be no satisfactory treatment for this disease.

The authors also discuss cornstock disease, sheep scab, other sheep diseases, the inspection of meat, milk, and cheese, rabies and other diseases of the horse (pp. 172–263). The seasonal distribution of rabies is discussed and notes are given on the prevalence of the disease among animals and also on the Pasteur treatment. This method of treatment is considered very effective and the establishment of the Pasteur Institute in Minnesota is recommended.

The subject of swamp fever in horses was studied extensively (pp. 264–374). The distribution and history of this disease are discussed in connection with detailed notes on the symptoms as observed in numerous outbreaks in Minnesota and Canada. The disease is of a chronic nature characterized by progressive emaciation and anemia. It is usually fatal, the mortality being about 80 per cent. The means of its spread are thus far not understood. From 21 post-mortem examinations *B. equisepticus* was obtained in 17 cases and this organism appears to be more virulent for rabbits than any other known to the authors. *B. equisepticus* is considered as being the pathogenic cause for swamp fever. In 6 other cases *B. pyrogenes equinus* was also demonstrated. The pathology of swamp fever appears also to be a septicemia accompanied by a great destruction of the red blood corpuscles.

Report on the operations of the veterinary sanitary service of Paris and the department of the Seine for the year 1903, H. MARTEL (*Rapport sur les opérations du service vétérinaire sanitaire de Paris et du département de la Seine pendant l'année 1903. Paris: Jehlen & Léquillon* [*1904*], *pp. 120*).—This report is chiefly occupied with a discussion of the means of combating the contagious diseases of animals and the means of inspection of meat and other animal products. The diseases ordinarily detected during the inspection of animals in stock yards at the public abattoirs at Paris are foot-and-mouth disease, glanders, tuberculosis, hog cholera, anthrax, sheep pox, swine erysipelas, and blackleg.

A detailed account is presented of the frequency of occurrence and the clinical symptoms of rabies in dogs and other animals. The author recommends that the sanitary police should be empowered to capture or destroy all homeless dogs. This is considered a necessity in combating rabies upon a successful basis. During the year 1903, foot-and-mouth disease appeared to be on the decline in the number of cases which were observed. It is not believed that the disease has been spread in large stock markets like the Villette market to the extent which has sometimes been supposed. A better organization of the sanitary police is recommended for the control of this disease.

Detailed statistics are presented concerning the prevalence of tuberculosis as determined by inspection of cows and inspection of meat at the public abattoirs. Particular attention was given to an investigation of mammary tuberculosis. Among 853 tuberculous cows 35 were found to be suffering from this form of the disease. It is believed, however, that this percentage is, perhaps, below that which actually exists. During these investigations 2 cases of primary tuberculosis of the udder were observed. The milk from cases of mammary tuberculosis was shown to be virulent even in minute doses.

Notes are given on the distribution and pathology of glanders. The value of mallein is believed by the author to be somewhat overestimated. Greater care in the control of

glanderous horses is recommended in order to check this disease. Brief notes are also given on anthrax, hog cholera, and other infectious diseases.

Annual report of the veterinary surgeon to the corporation of the city of Glasgow for 1903, A. M. TROTTER (*Ann. Rpt. Vet. Surg. [Glasgow], 1903, pp. 27*).—The author presents statistics regarding the number of animals slaughtered in Glasgow during the year under report, the production of home meat, inspection of meat, examination of imported meat at various localities, horse slaughterhouse, veterinary attendants on horses, hospital meat and milk contract, and the inspection of milch cows and cattle.

Various statistical matters are presented by means of tables and systems of curves. In the author's opinion based on meat inspection, about 89 per cent of cattle affected with tuberculosis acquired the disease through inhalation of tubercle bacilli into the lungs. Attention is therefore called to the danger of allowing tuberculous cattle even in the early stages of the disease to remain in contact with healthy animals.

Annual report of the Royal Hungarian Veterinary Academy, F. HUTYRA (*Magyar Kir. Állat. Foisk. Erkon. 1903–4, pp. 196*).—Notes are given on the publications of various members of the faculty of this institution, on the courses of instruction, and on the diseases studied at clinics and on other occasions.

Annual report of the civil veterinary department, Bengal (*Ann. Rpt. Civ. Vet. Dept., Bengal, and Bengal Vet. Col., 1903–4, pp. 15*).—Brief notes are given on veterinary dispensaries in various parts of Bengal as well as on various animal diseases particularly glanders and rinderpest. A brief report is also made on the work of the Bengal Veterinary College for the year 1903–4.

Annual report on investigations in the field of veterinary medicine, ELLENBERGER ET AL. (*Jahresber. Leist. Geb. Vet. Med., 23 (1903), pp. 315*).—As usual in these reports the chief results obtained in veterinary investigations in various lines are briefly outlined and classified according to the nature of the subject. The report covers investigations on all lines of infectious diseases, pathology, poisoning from various sources, therapeutics, materia medica, anatomy, histology, physiology, dietetics, animal breeding, veterinary jurisprudence, animal insurance, meat and milk inspection, veterinary police, etc.

Report on health of animals, J. G. RUTHERFORD ET AL. (*Extr. from Ann. Rpt. Dept. Agr. Canada, 1903, pp. 103, pls. 10*).—The organization of the veterinary service in the Dominion of Canada is outlined, and an account is presented of the various lines of work which have been undertaken. Hog cholera still prevails to a serious extent in certain parts of Ontario. In the control of tuberculosis it was found best to discontinue the official testing in Europe of cattle intended to be exported to Canada, and to adopt instead of this plan the testing of such animals after their arrival at the Canadian quarantine station.

Glanders is still a serious disease in various parts of Canada and has made its appearance in Yukon Territory. A description is given of the Canadian method of procedure in controlling this disease. Experiments for the purpose of determining the cause of Pictou cattle disease have been continued, and considerable evidence has been obtained to show that the disease is due to eating *Senecio jacobæa*. Notes are also given on a number of animal diseases, including actinomycosis, anthrax, blackleg, sheep scab, mange in cattle and horses, swamp fever, foot-and-mouth disease, etc. An account is also given of the Canadian quarantine stations, car inspection, and stock yards.

C. H. Higgins presents his second report as pathologist (pp. 27–41). In this report an account is given of the work of the pathological laboratory on anthrax, tuberculosis, glanders, hog cholera, Pictou cattle disease, and hemorrhagic septicemia. Notes are also given on methods of keeping laboratory records and on acetylene gas for general use in bacteriological laboratories. The greater portion of the

pamphlet is occupied with the reports of inspectors in various parts of the Dominion regarding the more important animal diseases in their localities.

The protection of animals against flies (*Rev. Agr. Réunion, 9 (1903), No. 9, pp. 329–331*).—Various forms of bland oils have been used in protecting domesticated animals against the attacks of different species of flies in hot weather. Among the various remedies which may be used for this purpose, a mixture of water and kerosene in equal parts, and a mixture of water, crude carbolic acid, and cresyl are recommended.

The fertility and sterility of echinococci in cattle, hogs, sheep, and horses, G. LICHTENHELD (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), Nos. 4, pp. 546–550; 5, pp. 651–662; 37 (1904), No. 1, pp. 64–73, pls. 2*).—From the literature relating to this subject and from personal observations, the author has compiled extensive data regarding the occurrence and relative fertility of echinococci in different domesticated animals.

With regard to the localization of echinococci it was found that in general the lungs are much more often infested than the liver. In hogs, however, the liver is more frequently infested. In older animals the percentage of infested livers is considerably lower than in young animals. In sheep, both the lungs and liver are usually infested simultaneously but the lungs more frequently. From a comparison of all data accessible to the author it appears that the ratio between infested lungs and livers is 69.3:27 in cattle, in male hogs 74.2:16.2, in female hogs 72:21.4, in sheep 52.2:44.9, and in horses 5.5:94.5.

An elaborate study was made of the proportion of fertile and sterile echinococci in species of domesticated animals. It appears from this investigation that the influence of the animal species is quite marked in determining the fertility of the echinococci. The ratio of fertile to sterile echinococci was found to be 24:76 in cattle, 80:20 in hogs, 92.5:7.5 in sheep, and 38.9:61.1 in horses. In cattle it was found that a larger proportion of the echinococci in the lungs were fertile than of those in the liver, while the reverse was found to be true for hogs and no differences were observed in this respect in sheep.

During a histological study of the echinococci it was found that the connective tissue sheath around the echinococci was largely the result of an inflammatory reaction of the surrounding tissue. In sterile echinococci, the inner layer of this membrane retains its cellular character. In fertile echinococci, the inner layers become metamorphosed into fibrous tissue and pronounced changes with new cell formation take place in the outer layers of the membrane.

Notes on certain epizootic diseases of Indo-China, YERSIN (*Ann. Inst. Pasteur, 18 (1904), No. 7, pp. 417–449*).—Periodically certain epizootic diseases prevail to an enormous extent in Indo-China and cause great losses among domesticated animals. In this article special attention is devoted to a study of rinderpest, buffalo plague, anthrax, surra, foot-and-mouth disease, and tetanus.

As a result of the author's extensive observations in Indo-China it is concluded that rinderpest exists in that country as an epizootic disease and is the chief cause of death among cattle. The disease has been confused with buffalo plague under the name hemorrhagic septicemia. Neither buffalo plague nor anthrax appears to have the importance or extent of distribution which is characteristic of rinderpest in Indo-China. Notes are given on the sanitary conditions which prevail in this country as related to the extent and distribution of infectious diseases.

A fungus disease in corn, A. T. PETERS (*Nebraska Sta. Rpt. 1903, pp. 13–22, figs. 2*).—In the year 1899 a disease broke out among domestic animals in Boyd County, Nebraska, and was later investigated by the author and A. A. Hunter. The symptoms of this disease resembled those of ergotism in many respects. Affected horses lost their hoofs by sloughing and similar effects were produced in cattle.

Affected chickens shed their feathers and hogs lost their hair. The owners of diseased stock attributed the trouble to alkali water. Chemical examinations of the water, however, failed to show the presence of any injurious elements in it.

In all localities where the disease prevailed the corn was found to be affected with a dry rot of a pinkish color. Experiments with feeding such corn to hogs showed that the disease could be reproduced in a typical form in this manner. The hair was shed and the hoofs sloughed off in hogs fed upon this corn. When the mold was cultivated on crackers and corn-meal mush and this material fed to hogs the disease was again reproduced. The fungus was found to be *Fusarium moniliforme*. It was found during the field work on this disease that the trouble ceased as soon as feeding with affected corn was discontinued. If the moldy corn was soaked before feeding it did not produce the disease.

The resistance of the red blood corpuscles in experimental tuberculosis, G. Humbert (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 19, pp. 896, 897*).—The majority of authors who have studied the resistance of red blood corpuscles in tuberculous animals have noted a diminution in their resistance during the progress of the disease. The exact nature of this process, however, was not understood and the author, therefore, attempted to study the modifications of the resistance of the red blood corpuscles during the progress of experimental tuberculosis.

The author's experiments were made on rabbits and the red blood corpuscles were determined by the method of Vaquez and Ribierre controlled by the method of enumeration. The animals were inoculated intravenously and intraperitoneally and in each case the animal received 1 cc. of a weak emulsion of human tubercle bacilli. A considerable diminution in the number of red blood corpuscles was noted. In some instances the number fell below 4,000,000 per cubic millimeter and in all cases the number fell below the normal.

No connection was observed between the variations in temperatures of the animal and the variations in the number of red blood corpuscles. It was shown, however, during these experiments that tuberculosis exercises a considerable influence in diminishing the resisting power of the red blood corpuscles.

A study of tuberculous fluids by indirect tuberculin reaction, L. Nattan-Larrier (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 4, pp. 135–137*).—The author tested the possibility of obtaining tuberculin reaction very shortly after inoculation with a fluid suspected of being tuberculous.

Guinea pigs were inoculated with 15 to 20 cc. of the suspected fluid in the fibrous sack of the mammary gland. After a period of 4 to 6 days a tuberculin injection was given and temperatures were taken for the purpose of determining any reaction. A thermic reaction usually began after 3 hours and persisted for about 24 hours. The reaction varied from 2 to 3.4°. In experiments during which a simultaneous inoculation of a suspected liquid and tuberculin were given, results were not always satisfactory, but the author believes that the results obtained by this method do not tend to cast doubt upon the value of the method proposed by Marmorek.

The determination of tubercle bacilli in liquids by means of a precocious tuberculin reaction, A. Marmorek (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 2, pp. 60, 61*).—The author had already determined the possibility of obtaining a tuberculin reaction in animals immediately after tuberculous infection. The method is explained as follows:

Guinea pigs are inoculated hypodermically with an emulsion of tubercle bacilli in physiological salt solution. After 30 minutes the skull is trepanned and 1/80 of a drop of tuberculin is introduced into the brain substance. The temperature rises rapidly and reaches the maximum within $2\frac{1}{4}$ hours, the elevation of temperature being from 2.2 to 2.4° C. It is thus possible to determine definitely the presence of tubercle bacilli in any given liquid, if after inoculation of experimental animals in the manner just described, a tuberculin reaction is obtained.

Mammary tuberculosis and the significance of acid-fast pseudo-tubercle bacilli in the diagnosis of this disease, R. OSTERTAG ET AL. (*Ztschr. Fleisch- u. Milchhyg., 15 (1904), No. 1, pp. 1-10*).—In these studies 10 cows suffering from mammary tuberculosis were purchased and used for experimental purposes. Another healthy cow was obtained and inoculated for the purpose of producing artificial infection in the udder.

The author's purpose in carrying out experiments on these cows was to determine whether mammary tuberculosis could be easily detected by a bacteriological examination of the milk, whether such milk contains acid-fast bacteria, which may be mistaken for tubercle bacilli, whether inoculation with milk samples from tuberculous udders may give a reliable diagnosis, and other similar problems.

It was found that tuberculosis of the udder consists essentially in painless swellings without any higher temperature than the surrounding tissue. These swellings are easily detected after milking, but may be overlooked in the full udder. It is considered that a certain diagnosis for mammary tuberculosis may be reached when one quarter of the udder and the corresponding lymphatic glands show painless, firm, knotty swellings without an elevation of temperature.

Contrary to the results obtained by certain investigators the author considers a tuberculin test as unsatisfactory for use in the diagnosis of this form of tuberculosis. In general a bacteriological test is considered as indispensable. It was found that in advanced cases of mammary tuberculosis the milk from affected quarters of the udder may be virulent in a dilution of 1:1,000,000,000. An examination of mucus from various mucous membranes may contain acid-fast pseudo-tubercle bacilli.

Vertebral tuberculosis in cattle, J. HAMOIR (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 18, pp. 627-636*).—Vertebral tuberculosis is said not to be of such exceptional rarity as commonly supposed. A number of cases have been met with during the author's experience, and four such cases are described in detail with notes on the symptoms, course of the disease, and pathological anatomy as shown at the autopsies.

The dorsal region of the vertebral column is affected with tuberculosis more frequently than the cervical or lumbar regions. As a rule the pathological processes affect exclusively the body of the vertebra which becomes softened and disintegrated. The symptoms of this form of tuberculosis are not characteristic. In general, some form of locomotor trouble appears. The owner of affected cattle frequently suspects a blow in the region of the loins as the cause of trouble. The symptoms become more and more severe despite all forms of treatment and finally result in death.

The milk of tuberculous cows, G. MOUSSU (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 13, pp. 617-619*).—A careful study was made of the milk of tuberculous cows for the purpose of determining the relative frequency of the occurrence of tubercle bacilli in it. None of the cows which were studied showed lesions in the mammary gland which could be detected by ordinary methods, but in all cases the existence of tuberculosis was determined by tuberculin reaction or by clinical observation.

The samples of milk were taken under antiseptic conditions, separated, and guinea pigs were used for inoculation tests. During these experiments 57 inoculations were made and 7 positive results were obtained. While in a great majority of cases the result was negative the positive results obtained in the other cases show that the milk of tuberculous cows may contain tubercle bacilli although no evidence of tuberculosis of the udder can be obtained by other means.

Avian tuberculosis, K. WOLFFHÜGEL (*Monatsh. Prakt. Tierh., 15 (1904), No. 9-10, pp. 457-471*).—Circumstantial clinical notes are given regarding a number of outbreaks of this disease among common fowls, turkeys, pheasants, guinea hens, and pigeons. The disease was also observed in pigeons in zoological parks as well as in the swan, *Corvus cornix*, and *Œdemia nigra*.

According to the author's experience, tuberculosis appears in an epizootic form quite frequently in domesticated fowls. It is believed that the most frequent form of the disease is the intestinal one. It is recommended as a most rational procedure in outbreaks of avian tuberculosis that all the fowls of the flock be slaughtered. This is recommended because it is impossible to detect the disease in the early stages and on account of the difficulty in treating or controlling it as long as the possibility of contagion from infected fowls remains.

Texas fever. II, Inoculation, G. E. Nesom (*South Carolina Sta. Bul. 90, pp. 71, figs. 17*).—This part of the author's general discussion of Texas fever is concerned with an account of inoculation experiments and the results thus obtained by the author and other investigators. From a summarized statement of results obtained from inoculation by other investigators it appears that the loss amounted to 7.6 per cent on an average. It is believed, however, that this loss should be reduced to 5 per cent. It is recommended that cattle over 2 years of age should not be inoculated. The season recommended for inoculation is late fall and winter.

Attention is called to the fact that there are many areas south of the quarantine line where no cattle ticks occur. Cattle raised on such areas must therefore be immunized in the same manner as northern cattle before being shipped to tick-infested areas. The effects of inoculation are shown in slight checks in the development of young cattle, loss of weight, occasional cases of abortion, and other disturbances. It is recommended that cattle be shipped south before inoculation and prevented from becoming infected until the period of inoculation fever is passed. They should then be exposed to gradual tick infestation within 6 months after inoculation.

A record is given of inoculation experiments carried out by the South Carolina Station on 388 head of cattle. Of this number 256 were northern and 132 southern cattle. One of these died as a result of inoculation fever and 2 from subsequent exposure to tick infestation. The loss in this series of animals therefore amounted to only 0.75 per cent. When the work of immunizing cattle to Texas fever began in South Carolina there were only 2 or 3 herds of pure-bred cattle in the State. Such cattle are now found in almost every county, and the prospects for beef production and dairy industry are believed to be good.

Milk fever; its simple and successful treatment, J. R. Mohler (*U. S. Dept. Agr., Farmers' Bul. 206, pp. 15, figs. 2*).—The name milk fever is considered as somewhat inappropriate as applied to this disease since the symptom of fever is frequently absent. Parturient paresis is considered a better term.

The author discusses the symptoms of the disease, post-mortem appearance, prognosis and mortality, and various theories regarding predisposition and etiology of the disease. A description is also given of the potassium-iodid treatment recommended by Schmidt and also of the new air treatment. The latter is considered as the most simple as well as the most efficacious and harmless method for treating milk fever. The various stages in the perfection of this treatment are noted and a detailed description is given of a simple apparatus for injecting filtered air into the udder.

The use of atmospheric air in the treatment of milk fever was first adopted by Andersen of Skanderborg, but has recently come into general vogue and has given uniformly satisfactory results. In preventing the development of milk fever it is usually recommended that means be taken to offset the bad results of the plethoric condition of the animal. This may be accomplished by keeping cows on small rations for about 2 weeks before calving or by administering large doses of Epsom salts for 2 or 3 days previous to this period. The same result may be brought about by abundant exercise. Recently it has been suggested that the occurrence of milk fever may be prevented by allowing susceptible cows to retain most of the milk in the udder for a period of 24 hours after calving.

Streptothrices as the cause of endocarditis in cattle, J. LUGINGER (*Monatsh. Prakt. Tierh., 15 (1904), No. 7-8, pp. 289-336*).—The literature relating to the bacteriology of endocarditis in animals and man is critically reviewed in connection with a brief bibliography. Detailed clinical notes are given on the course of endocarditis as observed in 2 cattle and the results of culture experiments with the organism as obtained are outlined.

Inoculation tests were made with this organism in white mice, guinea pigs, rabbits, dogs, and goats. As a result of the author's experiments it is concluded that valvular endocarditis may occasionally be observed in cattle and is due to a streptothrix which is carried in the blood. The organism differs in its morphology and behavior on culture media from the tubercle bacillus. It is referred to under the name *Streptothrix valvulas destruens bovis*. This organism is motile, is readily stained according to the Gram method, forms chains with true branching, and grows as a facultative aerobe or anaerobe. The pathogenicity of the organism was demonstrated by inoculation experiments.

Mycotic stomatitis of cattle, J. R. MOHLER (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 51, pp. 6, fig. 1*).—On account of the quite regular occurrence of this disease in various parts of the United States, and especially since it is sometimes mistaken for foot-and-mouth disease, a detailed description is given of the symptoms, pathological lesions, and approved treatment.

Mycotic stomatitis is noninfectious and attacks cattle of all ages while on pasture. The disease is due to eating forage affected with molds or parasitic fungi. Rusts and smuts of various sorts as well as other fungi have been suspected of causing the disease. The first symptoms are loss of appetite and inflammation of the mucous membrane of the mouth. In severe cases ulcers of considerable size may be formed especially on the gums around the incisor teeth.

Mycotic stomatitis may be distinguished from foot-and-mouth disease by the fact that it is noncontagious, while the latter rapidly spreads through the entire herd and affects hogs and sheep as well. The disease may be differentiated from ergotism by the fact that in the latter disease there are no ulcers in the mouth and by the peculiar lesions on the ears, tip of the tail, and legs in poisoning from ergotism.

In treating mycotic stomatitis the author recommends that affected animals be brought in from the pasture and given plenty of clean water in which a small quantity of borax is dissolved. The mouths may be washed out with a 2 per cent solution of carbolic acid or creolin, a 1 per cent solution of lysol or permanganate of potash, or a solution of hydrogen peroxid at the rate of 1 part to 2 of water. As an alternative method the author suggests mixing 2 tablespoons carbolic acid in a quart of bran mash and giving these daily to each affected animal for a period of 5 days.

Enzootic anthrax in horses and its control by the method of Sobernheim, A. JAEGER (*Monatsh. Prakt. Tierh., 15 (1904), No. 11, pp. 512-528*).—The enzootic occurrence of anthrax in horses is quite frequently observed under conditions which indicate the food as a source of infection. In a number of such outbreaks the author tested the value of Sobernheim's method in treating the disease.

These experiments demonstrated that the therapeutic action of the serum depends almost entirely upon the method of inoculation. Subcutaneous inoculation even in large doses merely served to check the progress of the disease for a few days, but did not protect the animal against a fatal outcome. Intravenous injection of serum, however, was almost always sufficient to save the life of even badly affected animals and this method is quite harmless. It was found that horses even in the acute stages of the disease successfully withstood intravenous injections of 120 gm. of sheep serum.

An investigation of oats which served as food in one outbreak showed that the oats in question were infected with the anthrax spores. Experiments were instituted for the purpose of devising a practical means of destroying the anthrax spores in

oats. For this purpose formaldehyde fumes, chloroform fumes, and heat were used. It was found that a dry heat of the temperature of 180 to 200° C. for a few minutes was required to destroy the anthrax spores. The best apparatus for treating oats for this purpose appears to be the apparatus commercially used for desiccating potatoes.

Treatment of acute, nonsuppurative arthritis, particularly arthritis of colts, by means of puncture, E. Liénaux (*Ann. Méd. Vét., 53 (1904), No. 9–10, pp. 504–514*).—A description is presented of the symptoms and pathological anatomy of various forms of acute arthritis without the formation of pus. The author operated on a number of cases of this sort in young colts by means of punctures made during the early stages of the disease. The method of operation was adopted on account of the success which had already been had in treating acute pleurisy in the same manner. When antiseptic precautions are observed good results follow this treatment.

Chronic periarthritis tarsi of horses, Gossmann (*Monatsh. Prakt. Tierh., 15 (1904), No. 9–10, pp. 385–417*).—A critical review is given of the literature of this subject in connection with a brief bibliography. The author discusses the anatomy of the tarsal joint in the horse with especial reference to the various diseases to which this joint is subject.

A detailed account is given of the gross and microscopic anatomy of periarthritis, together with notes on the symptoms which usually appear in cases of this disease. A complete recovery rarely occurs. Nevertheless, considerable benefit was to be derived from the application of cold during the early stages of the disease and later massage. According to the author's experience the use of drastic salves and cautery is not to be recommended.

The existence of a trypanosomiasis of horses in French Guiana, A. Laveran (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 8, pp. 326, 327*).—The author examined the blood of 3 horses apparently affected with some form of trypanosomiasis. In 2 of the horses no blood parasite was found, while in a third parasites were observed which closely resembled *Trypanosoma brucei*. The disease is therefore believed to be nagana.

Spontaneous tetanus as influenced by heat, H. Vincent (*Ann. Inst. Pasteur, 18 (1904), No. 7, pp. 450–464*).—The author discusses in a critical manner the question concerning the existence of spontaneous species of tetanus in animals. The influence of heat upon the development of tetanus was studied in an experiment with guinea pigs.

The subjection of these animals to high degrees of temperature was found to cause numerical modifications in the leucocytes, changes in the relative proportions of different kinds of leucocytes, and histological alterations in the structure of the leucocytes. In animals which were maintained at temperatures of 42.5 and 43° C. the phagocytes were dissolved to considerable extent and this reduction in the number of leucocytes is considered as having bearing on the reduced resisting power of such animals toward tetanus bacillus and other pathogenic organisms.

Manson's eye worm of chickens and notes on the spiny-suckered tapeworms of chickens, B. H. Ransom (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 60, pp. 72, pl. 1, figs. 52*).—The first part of this bulletin contains an elaborate account of Manson's eye worm (*Oxyspirura mansoni*) which had not been previously reported from America, while in the second part of the bulletin a discussion is given of 2 species of tapeworms (*Davainea echinobothrida* and *D. tetragona*), both of which affect poultry.

Manson's eye worm is found beneath the nictitating membrane of the eye of chickens. The presence of these worms in the eye does not always cause any pronounced symptoms at first; later, however, an inflammation sets in which may subsequently involve the whole eyeball, causing the cornea to become opaque and finally destroying the eye. Treatment consists in removal of the worms by means of small forceps and washing the affected parts with a 1 or 2 per cent solution of creolin or with a solution of bicarbonate of soda.

The life history of this parasite is unknown, and no special precautions can therefore be recommended preventing infestation by it except the general observance of sanitary conditions about poultry houses. The parasite is carefully described. Infection experiments with eggs containing embryos which were placed in the eyes of young fowls gave negative results. A general review is presented of nematode worms which are parasitic in the eyes of birds.

In a discussion of the spiny-suckered tapeworms of chickens 2 species are recognized and distinguished in place of the one species which has previously been recognized. Of these 2 species *Davainea echinobothrida* is of considerable economic importance and causes the nodular disease of the intestines in fowls, while the other species, *D. tetragona*, produces no apparent lesions.

The diseases of fowls (*Rev. Agr. Réunion, 9 (1903), No. 9, pp. 331-336*).—A brief account is presented of unsanitary conditions which may predispose fowls toward infection with various diseases. Particular attention is given in the article to roup, cholera, diarrhea, etc.

Fowl cholera, A. J. Carbajal (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 19 (1903), No. 8-10, pp. 213-217, pl. 1*).—An outbreak of this disease was studied in the town of Tacuba. The disease attacked common fowls, geese, and turkeys, and occurred in an exceedingly virulent form. The organism was isolated and tested by means of inoculation experiments. It was found to be identical with that described by European authors. The organism proved to be pathogenic for pigeons.

Rabies toxin, P. Remlinger (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 8, pp. 346-350*).—A study was made of rabies virus by means of artificial inoculation combined with careful observation of the clinical symptoms thus produced. The author suggests as a possibility that the ultra-microscopic organisms of rabies may possess an intracellular toxin. Several facts observed in the course of the author's studies are mentioned as favoring the assumption of the existence of a rabies toxin.

Investigations on strong esterdermasan, F. Haan (*Monatsh. Prakt. Tierh., 15 (1904), No. 11, pp. 481-512*).—This drug is described as a soap preparation containing from 12 to 24 per cent free salicylic acid and its esters. A number of experiments were carried out by the author in treating various diseases of domesticated animals and in testing the effect of the drug upon healthy animals. It appears that strong esterdermasan may be used as a local resorbent, anesthetic, and antirheumatic remedy. It appears to be of considerable value in the treatment of purulent dermatitis, phlegmons, and mastitis of cows. Spavin and arthritis in horses may also be beneficially treated with this drug.

AGRICULTURAL ENGINEERING.

Improved methods of irrigation (*Jour. Columbus Hort. Soc., 19 (1904), No. 3, pp. 112-114*).—A brief note on two systems of irrigation by sprinkling which are being tested by the Ohio Experiment Station.

The possibilities of irrigation in Germany (*Arb. Deut. Landw. Gesell., 1904, No. 97, pp. 75, figs. 12*).—This is a series of addresses and papers before the farm culture section of the German Agricultural Society, containing discussions of various phases of this subject, in which free use is made of the results obtained in the work of the irrigation and drainage investigations of this Office.

How can the productiveness of lands subject to periodic droughts, such as light soils of North Germany, be assured and increased by means of irrigation? Backhaus and J. Gyárfás (*Illus. Landw. Ztg., 24 (1904), No. 85, pp. 963-986, figs. 30*).—A prize essay making free use of the matter and illustrations of the publications of the irrigation and drainage investigations of this Office.

The irrigation of vineyards near Beaucaire, J. Farcy (*Jour. Agr. Prat., n. ser., 8 (1904), No. 46, pp. 639-643, figs. 4*).—A system of irrigation by means of pumped water is described.

Egyptian agriculture, with special reference to irrigation, P. N. JOANNIDES (*Scottish Geogr. Mag., 20 (1904), No. 11, pp. 561–568*).—This article briefly discusses the soil, climate, animal life, native population, the rise and fall of the Nile and the composition of its waters, crops and crop seasons, and methods of irrigation (basin system of middle and upper Egypt and canal or perennial system of lower Egypt). The advantages to be gained from the use of stored water, especially that impounded by the Assuan dam, are pointed out.

A note on irrigation in the Bombay Presidency (India), W. L. STRANGE (*Transvaal Agr. Jour., 2 (1904), No. 8, pp. 506–512*).—The conditions and methods of irrigation in the inundation area, the large storage reservoir area, the small storage reservoir area, and the rain supplied area of Bombay Presidency are described.

General report on irrigation and drainage in the Lower Menam Valley, J. H. VAN DER HEIDE (*Bangkok, Siam: Ministry of Agriculture, 1903, pp. 149+VIII*).—This is the detailed report, a review of which has already been noted (E. S. R., 16, p. 305). It is stated that this report "is not meant to give any detailed plan, but only to show the possibility and utility of adequate irrigation and drainage in lower Siam and to indicate the outlines of the principal scheme, in order to form a basis of provisional consideration for the government, and further to point out the direction in which plans should be made."

It deals with the possibilities and utility of irrigation and drainage in this valley, the urgency of improvements, and outlines plans of construction, management, and organization. An appendix gives summaries of all available rainfall statistics for the region.

Irrigation of paddy, F. LIMOUZIN (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 10, pp. 944–947, fig. 1*).—What is known as the swamp or bund (flooding) system of irrigation in India is described.

Ditching dredge at Council Bluffs, Iowa (*Engineer. News, 52 (1904), No. 17, p. 382, figs. 3*).—The construction of this dredge and the nature of its work are described.

Recent improvements in methods for the bacterial treatment of sewage, W. J. DIBDIN (*London: Sanitary Pub. Co., 1904, pp. 32; rev. in British Med. Jour., 1904, No. 2287, p. 1175*).—Various methods of the author and others are described and discussed.

Sewage disposal in England, A. BREDTSCHNEIDER and K. THUM (*Mitt. Kgl. Prüfungsanstalt Wasser. u. Abw. Berlin, 3 (1904), pp. 264, figs. 46; rev. in British Med. Jour., 1904, No. 2287, p. 1175*).

Suggestions concerning the septic treatment of sewage of farm and station homesteads, T. W. SEAVER (*Agr. Gaz. New South Wales, 15 (1904), No. 10, pp. 963–966*).—A popular explanation of the principles underlying septic purification of sewage, with general suggestions as to how it may be successfully employed on a small scale.

Traction engine plowing at the Central Experiment Farm (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 8, p. 744, pl. 1*).—A brief account is given of trials of an 8-horsepower engine combined with 2 plows, one heavy 6 disks and the other 4 disks, on very hard soil, in which the rate of plowing was an acre in 1 hour and 36 minutes, the consumption of coal per working day being half a ton.

The largest plow in the world, A. INKERSLEY (*Amer. Inventor, 12 (1904), No. 22, p. 466, fig. 1*).—A plow built for use on a ranch near Bakersfield, Cal., which is 18 ft. high and cuts a furrow 8 ft. wide and 6 ft. deep, is described.

The experimental grain elevator and scientific investigations in it, J. F. HOFFMANN (*Das Versuchs-Kornhaus und seine wissenschaftlichen Arbeiten. Berlin: Versuchs-Kornhaus, 1904, pp. XII + 593, pls. 7, figs. 65*).—The grain elevator constructed for experimental purposes in Berlin in 1898 is described, and the results of series of experiments with various appliances for handling and treating the grain

(drying, warming, ventilating, etc.), and in treating for protection against insect and fungus enemies, are reported.

The cement resources of Alabama, E. A. SMITH (*Geol. Survey Alabama Bul. 8, pp. 61–93, pls. 16*).

The materials and manufacture of Portland cement, E. C. ECKEL (*Geol. Survey Alabama Bul. 8, pp. 1–59*).

Fuel-testing plant of the United States Geological Survey (*U. S. Dept. Interior, Geol. Survey, pp. 12*).—A description of the plant installed at the Louisiana Purchase Exposition for testing the steam, gas, and coke producing power of different fuels; for briquetting, storage, and washery operations; and for chemical examination of fuels, with a brief statement of some of the general results obtained in the various tests.

MISCELLANEOUS.

Seventeenth Annual Report of Nebraska Station, 1903 (*Nebraska Sta. Rpt. 1903, pp. 112, pls. 4*).—This contains the organization list, a brief review of station work during the year, a financial statement for the fiscal year ended June 30, 1903, and several articles noted elsewhere.

Annual Report of South Dakota Station, 1904 (*South Dakota Sta. Rpt. 1904, pp. 9–21*).—An outline is given of the work of the station during the year by the heads of the various departments. A financial statement for the fiscal year ended June 30, 1904, is included.

Summary of the work of the Poltava experiment field for 15 years (1886–1902) (*Kormovuiya rasteniya. Poltava, 1902, pp. VII+196; rev. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 5 (1904), No. 4, pp. 554–556*).

Foreign markets for American fruits (*U. S. Dept. Com. and Labor, Spec. Consular Rpts., 32 (1904), pp. 218*).—Statistics are given of the fruit trade of the United States, the United Kingdom, Germany, France, and the Dominion of Canada, covering for the most part the years 1898, 1902, and 1903. Included in the report are the replies to a circular of inquiry issued by the State Department to American consuls in all foreign countries on the extent of the use of American fruits in such countries, methods observed in conducting the trade, and suggestions for improvement of the trade in American fruits.

Course in nature study for primary grades, ANNIE M. GODING and MARY C. BREEN (*Hampton, Va.: Hampton Institute Press, 1904, pp. 27*).—This is an outline course in nature study prepared by teachers in Normal School No. 1, Washington, D. C., and published by the Hampton Nature Study Bureau for the use of teachers in the common schools to aid them in preparing pupils for the use of "Agriculture for Beginners," by Burkett, Stevens & Hill, which has been introduced into a large number of schools in Virginia.

The course is divided into fall, winter, and spring term work, and includes suggestions for weather observations; garden work; study of economic plants, trees, and fruits; dissemination of seeds; insects; birds; a few of the mammals; tadpoles, frogs, toads, etc. In the latter part of the course considerable space is given to domestic animals and fowls.

Agricultural investigations in the Province of Santa Fé, H. MIATELLO (*An. Min. Agr. Argentina, Sec. Agr. [Agron.], 1 (1904), No. 3, pp. 539, figs. 137, maps 7*).—A book reviewing at some length the agricultural conditions of the province, the culture of the principal crops, and the progress of agricultural industries. The soil, climate, colonization and population, farm management, transportation, taxes, and insurance are considered, and a number of chapters each are devoted to the culture of wheat, flax, corn, potatoes, peanuts, and forage crops. Discussions are also given on the milling, dairying, sugar, oil, and other industries.

German agriculture at the St. Louis Exposition of 1904 (*Die Deutsche Landwirtschaft auf der Weltausstellung in St. Louis 1904. Berlin: Unger Bros., 1904, pp. 206*).—The exhibits in agriculture are enumerated and described, and the different phases of German agriculture are discussed. Brief sketches are given of the agricultural institutions of the country. The different topics presented are climate, soils, agricultural population, different forms of agriculture, such as agronomy, viticulture, horticulture, etc., animal husbandry, and public means, including agricultural education for the improvement of agriculture.

Experiment Station Work, XXVII (*U. S. Dept. Agr., Farmers' Bul. 210, pp. 32, figs. 7*).—This number contains articles on the following subjects: Preservation and value of hen manure; nitrate of soda for field crops; varieties, culture, and quality of wheat; breeding corn of special composition; effect of irrigation on the quality of crops; the effect of shading strawberries and vegetables; injuries to shade trees; soft corn and its value for beef production; hay substitutes; oak leaves as forage; the covered milk pail; canning cheese; millet seed for hogs; and fertilizers for potatoes.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, Nos. 4, pp. 25–32; 5, pp. 33–40; 6, pp. 41–48*).—These numbers for August, September, and October, 1904, contain the usual statistical reports on the crops in the United States and foreign countries. Particular mention may be made of articles dealing with cocoanuts, copra, and cocoanut oil, and the fruit trade with foreign countries, the latter of which has been noted elsewhere (E. S. R., 16, p. 264).

Methods and routes for exporting farm products, E. G. WARD, Jr. (*U. S. Dept. Agr., Bureau of Statistics Bul. 29, pp. 62*).—This contains an enumeration of the principal agricultural exports of the United States, billing instructions, and lists of fast freight lines and of foreign and domestic ports between which steamboats regularly ply.

The agricultural distribution of immigrants, R. DEC. WARD (*Pop. Sci. Mo., 66 (1904), No. 2, pp. 166–175*).—Considerable restriction of immigration is considered very desirable and the proposition to distribute immigrants throughout the agricultural districts of this country, while admittedly a remedy for existing evils resulting from the settling of immigrants in cities, is shown to be fostered, in many instances at least, by transportation companies and by no means free from serious objections worthy of careful consideration.

Review of legislation, 1903—general agriculture, E. W. ALLEN (*New York State Library Legislation Bul. 22o, pp. 1–14*).—A review of legislation relating to State agricultural departments, experiment stations, farmers' institutes, agricultural statistics, weeds and noxious animals, commercial feeding stuffs, and fertilizers.

NOTES.

Connecticut Storrs College and Station.—C. K. Graham has recently been appointed instructor in poultry husbandry and poultryman in the college and station, respectively. Experiments in poultry raising will be made an important feature of the work of the station.

Illinois Station.—J. W. Hart, of the dairy department, has accepted an appointment as director of the agricultural school at Piracicaba, São Paulo, Brazil, and will sail for South America in March. Ira O. Schaub has resigned the position of assistant chemist in the station to accept a position as assistant professor of soil fertility at the Iowa College and Station.

Iowa College.—According to press reports, about 600 farmers, young and old, were enrolled in the short courses in corn and live-stock judging, which were held at the college early in January. In addition, several hundred others attended the courses for one or two days at a time. The main attendance was said to be composed of active farmers, who proved to be an exceedingly enthusiastic lot of students.

Louisiana College and Stations.—B. H. Guilbeau has been appointed professor of zoology and entomology in the college, vice H. A. Morgan, who, as previously noted, has become director of the Tennessee Station; and Wilmon Newell, formerly State entomologist of Georgia, has succeeded Professor Morgan as entomologist to the State station. J. E. Halligan, of the sugar station, has severed his connection with the station to accept a position with a commercial firm in Cuba. H. P. Agee, F. B. Ricketts, and J. A. Verret have been appointed assistant chemists at that station.

Nebraska University and Station.—The college of agriculture reports 39 students in agronomy, 40 in animal husbandry, 40 in entomology, 31 in forestry, and 26 in horticulture. There are 135 students in the 3-years' course and 149 in the winter course. A great deal of interest has been awakened by the university and station through the "seed corn special," which has been operated in cooperation with two of the leading railroads having a large mileage in the State. These special trains in 14 days covered a large part of the corn belt. Experts upon tillage and seed corn selection talked to 19,000 farmers at the various points where stops were made. There has been a large increase in the number of applications for farmers' institutes, and more than 150 will be held this year. About 20,000 inquiries per year come to the station asking for information upon agricultural subjects.

New Hampshire Station.—Harry D. Batchelor, assistant chemist, has resigned, and Albert C. Blaisdell, of Tufts College, has been appointed his successor.

Pennsylvania College.—Andrew Carnegie has donated to the college the sum of $25,000 as the endowment of a beneficiary fund, the annual interest of which at 5 per cent is to be used for the aid of deserving students, in such manner as the board of trustees may direct. Mrs. Carnegie has donated a like sum, the annual interest of which at 5 per cent is to be expended for the maintenance of scholarships to be awarded under the direction of the trustees.

Virginia Station.—Charles F. Holdaway has entered upon his duties as foreman of the dairy division. Plans have been completed for a new barn for handling the crops grown in field experiments. The barn will be 44 by 64 ft. in size and 3 stories in height consisting of a basement and 2 floors. The basement will contain

the implement and tool rooms and stabling for the live stock used in the field experiments. The second floor will contain the thrashing and cleaning rooms and storage for seeds. The third floor will be provided with rat-proof cases for the preservation of specimens. Arrangements will be made so that the crops from a large number of plats can be stored and kept under the most favorable conditions until thrashed. This barn is designed especially for the work it is intended to accommodate.

Irrigation and Dry Farming.—The Office of Experiment Stations has entered into a cooperative experiment with the Northern Pacific Railroad and the Montana Experiment Station to study the application of irrigation in a limited way in dry farming, and to determine how far it is possible to extend agriculture in Montana outside of the valleys where ample water for irrigation can be obtained. Experiments will be made with 10 or 12 farmers in testing methods of applying water, the conservation of soil moisture, the benefits of winter irrigation, and the cost and profits of pumping water for irrigation. The irrigation and pumping work will be under the direction of Elwood Mead, of this Office, and the Montana Station will look after the cultural features.

A similar cooperative undertaking is to be carried on in the vicinity of Cheyenne, Wyoming, the Office cooperating in this case with the Burlington, Union Pacific, and Colorado Southern railroads, and with certain organizations in the State.

Lectures on Forestry.—Following the sessions of the Forest Congress, the Yale Forest School held a series of lectures in the Assembly Hall of the Bureau of Forestry at Washington, January 7–13. The students of the school had been in attendance upon the Forest Congress, and remained over for these lectures as a part of their regular work. In addition, the delegates to the Forest Congress were invited to attend. Lectures were given by Gifford Pinchot on forest policy, by Capt. George P. Ahern on the Philippine forests, by F. V. Coville and A. F. Potter on the grazing problem, by F. E. Olmsted on forest reserves, by G. B. Sudworth on dendrology, by W. L. Hall on forest extension, by Raphael G. Zon on sylvicultural research, and by F. H. Newell on hydrography. There were also addresses by B. E. Fernow, Filibert Roth, Judson F. Clark, T. H. Sherrard, and others.

Leucocytes in Milk.—In investigations concerning the occurrence and significance of leucocytes or pus cells in cows' milk, C. F. Doane and S. S. Buckley of the Maryland Station have adopted the following method: Ten cubic centimeters of milk are centrifuged for 5 minutes in a graduated sedimentation tube at a speed of approximately 2,000 revolutions per minute. The fat is removed by means of absorbent cotton and the milk siphoned to 0.5 cc. Two drops of an alcoholic solution of methylene blue are then added to the sediment and thoroughly mixed by shaking, when the tube is placed in boiling water for 2 minutes. The volume is then made up to 1 cc. by the addition of water, and the actual number of cells in this sample is determined by counting in a Thoma-Zeiss cell using a $\frac{1}{6}$ objective. In the method described by Stokes and adopted by D. H. Bergey, the leucocyte content is judged by the number of cells appearing in the field of a $\frac{1}{12}$ immersion lens. Some comparative counts by the two methods are here given, those by the new method being stated in cells per cubic centimeter, and those by the Stokes method, inclosed in parentheses, in cells per field of the immersion lens: 365,000 (45), 355,000 (18), 284,000 (18), 1,000,000 (22), 525,000 (10), 468,000 (30), 1,200,000 (65), 4, 600,000 (75), 500,000 (10), and 328,000 (35).

Although the results by the two methods are not directly comparable, there is evidently an entire lack of harmony which would cause a doubt as to the reliability of one of the methods for this purpose.

New Centralblatt for Dairying.—The editorship of the *Milch Zeitung*, one of the leading foreign dairy journals, was transferred on January 1, 1905, from Professor Ramm to Dr. R. Eichloff, director of the dairy institute at Greifswald. This change was necessitated by the professional duties of the former editor.

Coincident with this change is the establishment of the *Milchwirtschaftliches Zentralblatt* as a scientific monthly supplement of the *Milch Zeitung*. The first number of the *Milchwirtschaftliches Zentralblatt* was issued with the beginning of the year. On the title page appeared the following as associate editors: Professor Albert, Königsberg; Director du Roi, Prenzlau; Dr. Herz, Munich; Dr. Hittcher, Kleinhof-Tapiau; Professor Kirchner, Leipzig; Professor Klein, Proskau; Professor Ramm, Dahlem; Dr. Tiemann, Wreschen; Professor Vieth, Hameln; Professor Weigmann, Kiel.

The first number contains 6 original articles by well-known authors, 7 excellent abstracts, and several brief notes. On the whole, the publication corresponds in character to the *Revue générale du lait* (E. S. R., 13, p. 1112) and to the *Centralblatts* along other lines. The high grade of the journal will surely secure for it a hearty welcome by investigators in dairy lines.

Meeting of the American Association for the Advancement of Science.—At the meeting of the association at Philadelphia during the holidays, more than five hundred papers were presented before the various sections and affiliated societies, covering a very wide range of subjects in the exact and natural sciences and their applications. There were a notable number of papers of popular interest, and among those related to the application of science to industry and daily life agriculture came in for a good share.

Botanical papers.—The following papers, among others, were presented before the section for botany. In a paper on Observations on the Teratology of the Pineapple, M. T. Cook expressed the belief that a careful study of teratology will be of some service in taxonomy and morphology. Thirteen types of variation on the Smooth Cayenne variety of pineapple were described. Many of these are attributed to the character of the stock, the method of cultivation, or the kind of fertilizer used.

F. W. Rane described Economic Methods in Restocking White Pine Forests, an account of which is given under the meeting of the Society for the Promotion of Agricultural Science. In Suggestions from the Study of Dairy Fungi, C. Thom pointed out the desirability of more certain and uniform means of describing and determining common saprophytic fungi, based especially on their physiological and morphological relations. He detailed the characters of certain species of Penicillium grown upon several substrata. In spite of wide variation on different substrata a constantly recurring series of characters were observed, and those of value in the genus were summarized.

Perley Spaulding, discussing Cultures of Wood-Inhabiting Fungi, stated that it had been found easier to make cultures of wood-rotting fungi from actively growing mycelium than from the spores. Agar made from infusions of the species of wood upon which the fungus is found usually serves to start the growth of the mycelium, which can then be transferred to tubes of sterilized green wood. Inoculations with mycelium of *Lenzites sepiaria* have shown no parasitic action, but in cut timber have produced fruiting bodies in less than five months.

The Effect of Climatic Conditions on the Vitality of Seeds was described by J. W. T. Duvel in a preliminary report of experiments in which seeds were stored in ordinary seed packages and in air-tight containers. Seeds put up in this way were sent to 60 stations throughout the United States, and to a number of places in the tropics and in cold climates. At the expiration of six months and of one year complete sets from each station were returned and tested for vitality. A great deterioration was found in the seeds contained in paper packages which were stored in localities having a warm humid atmosphere, while the seeds put up in air-tight containers preserved their vitality much better under these conditions. In comparatively warm climates seeds showed no appreciable loss of vitality when put up in either way.

The Germination of Seeds as Affected by Soil Temperature was reported upon by Edgar Brown. From March 26 to June 30 plantings of twenty different kinds of seeds were made at intervals of two or three days, and records kept of the appear-

ance of the first sprouts and the total germination, together with the soil temperatures at depths of from one-fourth inch to two feet, of the air temperature, and of solar radiation. Great variations were found in the germination results. Lettuce germinated well early in the season when the temperature was comparatively low, but poorly later, while the reverse was true of corn and many other seeds. Seeds of low vitality germinated much more slowly than those of high vitality, and were much more affected by unfavorable conditions. The time between planting and the appearance of the first sprouts was generally inversely proportional to the percentage of germination.

Burton E. Livingston traced The Relation of Transpiration to Other Functions, using wheat plants grown in soil and in nutrient solutions. Transpiration was found to be proportional to the leaf area, and while its relation to leaf weight was not quite so simple, the variation was said to be too small to interfere with the use of transpiration as a criterion for estimating relative leaf weight. The conclusion from the tests was that soils or solutions may be compared in respect to their power to support growth by means of the total transpiration. Studies were reported on the relation of transpiration to the absorption of salts in water cultures. Under like conditions transpiration was found to be proportional to the amount of salts absorbed, but when one culture was grown in a moist atmosphere and another in a relatively dry one this relation did not hold, the transpiration being checked to a marked degree in a moist air, while the absorption of salts was checked only to a very slight degree, if at all.

The Salt Water Limits of Wild Rice, as studied by C. S. Scofield in three delta regions, were found to be equivalent to a 0.031 normal solution of sodium chlorid. Where the water surrounding the plants was more saline, the growth of wild rice was nearly or quite inhibited.

F. H. Blodgett described The Fasciation of Field Peas. In the case cited peas were grown from seed secured from a feed dealer who knew nothing of their pedigree or quality. Not more than 5 per cent of the crop formed. The conditions of the soil and temperature combined to produce a very vigorous growth of vine, which, instead of setting pods, became fasciated, forming tubular or flattened stems bearing large numbers of flowers at the upper end which set practically no seed. The stems had the appearance of two tubes, the inner one tapering downward to a point and united to the upper cylindrical portion by the common rim, along which the flower clusters were developed. The two tubes were practically free from any connection with each other except at the end, and each bore upon its exposed surface leaves and branches, the inner one in a lesser degree. Many of these branches were hollow and often somewhat flattened or fasciated. This condition was found on two fields of approximately fifteen acres, upon which the crop was a total failure.

The programme of the Botanical Society of America included the following papers, among others, no abstracts of which have been secured: Address of the past president, C. R. Barnes, on The Theory of Respiration; Physiological Drought in Relation to Gardening, by I. B. Balfour; Cultures of Uredineæ in 1904, by J. C. Arthur; Cultures of Uredineæ in 1904, by W. A. Kellerman; The Effects of Certain Nutrients on the Toxic Action of Some Agents Deleterious to Fungi, by B. M. Duggar; Transpiration and Stomatal Action in a Desert Plant (*Fouquieria splendens*), by F. E. Lloyd; Mutations and Hybrids of the Evening Primroses, by D. T. MacDougal; Some Studies Regarding the Biology of Buds in Winter, by K. McK. Wiegand; Ecological Notes on the Vegetation of Southeastern Florida, by H. C. Cowles; Studies in Etiolation, by A. D. Selby; The Oxidizing Enzyms in the Opium Poppy, by R. H. True; and Photomicrography Applied to the Comparative Study of the Spores of Mushrooms, by G. F. Atkinson.

Steps were taken in the direction of a union of the Botanical Society of America, the Society for Plant Morphology and Physiology, and the Botanical Club of the

association into a single organization, to be known as the Botanical Society of America. If this plan materializes, there will be provision for holding special sessions or section meetings devoted to the different branches of the subject as occasion may arise, although the plan does not contemplate the formation of permanent sections.

The following committee was appointed by the botanical section to confer with a like committee from the Association of Official Agricultural Chemists (E. S. R., 16, p. 324) on the definition of the term "plant food": C. R. Barnes, University of Chicago; F. C. Newcomb, University of Michigan; D. T. MacDougal, New York Botanic Garden; H. M. Richards, Barnard College; and B. E. Livingston, University of Chicago.

In the section for social and economic science, B. E. Fernow discussed the Movement of Wood Prices and their Influence on Forestry Treatment; and W. R. Lazenby reviewed The Present Demand for and the Economic Uses of Wood.

American Chemical Society and Section C.—In a paper on Some Present Problems in Industrial Chemistry, Edward Hart referred to the reputed finding of nitrate of soda in Death Valley, and stated that thus far no material progress had been made in making nitrates in this country, the electric method not having proved sufficiently cheap as yet. The making of our own nitrates would add $11,000,000 to our National wealth. The discovery of some source of potash to compete with the Stassfurt salts was mentioned as affording a great opportunity, and the possibility of making potash from feldspar commercially was suggested. In noting some of the things to be undertaken in the future, Dr. Hart pointed out that we must raise more of our sugar at home, and must induce farmers to fertilize their land more liberally, to replace what is removed by the crops in order that the fertility of the land may be maintained.

W. F. Hillebrand presented Some Thoughts upon the Present Condition of Analytical Chemistry, which proved exceedingly interesting and suggestive. He pointed out discrepancies in present methods of analysis in a number of lines, and urged that there should be a determined will and sentiment to improve the analytical methods and practice followed—at least to inquire into the character of the chemicals and the water used in such work. Part of the carelessness in this respect was ascribed to the student's early training, and the point was made that he should be taught to look for the errors in his work and to determine the quality of his reagents. The speaker deprecated the so-called "cookbook methods" of analysis, which were followed blindly and in a mechanical sort of way. He hoped for some help from the Bureau of Standards in testing methods and furnishing means for checking the work of chemists.

H. W. Wiley discussed Diet in Tuberculosis, and W. D. Bigelow gave a preliminary note on The Ripening of Peaches, describing an investigation upon this topic carried on under his direction, but reserving the results for future publication.

Discussing The Interpretation of a Water Examination, W. P. Mason emphasized the value of a sanitary survey, which he placed first in importance in the examination of water supply, if only one form can be made. The chemical examination has often called attention to a dangerous condition of the water, although the bacteriological side is now recognized as of great importance. All three of these forms of examination—the sanitary survey, the chemical, and the bacteriological examination—should, if possible, be used together. Referring to the use of copper sulphate for the purification of water, he questioned whether or not copper, like lead and other heavy metals, is a cumulative poison. Its use for killing germs in water was thought to be more objectionable than its use against algæ, since for the former purpose it must be used continuously.

L. P. Kinnicutt discussed The Determination of Oxygen Consumed in Water Analysis, reporting the results obtained on about a dozen samples by eight methods. The results disagreed very widely according to the time and temperature of the treatment. He preferred Palmer's method, as the conditions can be kept more con-

stant and alike in all laboratories. The same speaker, under the title of Standard Methods to be Used in the Sanitary Analysis of Water, presented a report of the committee on the development of standard methods, to be published soon. S. D. Gage, in a paper on Biochemistry of Sewage Purification, discussed the bacteriolysis of peptones and nitrates.

The Need of Action regarding the Adulteration of Foods and Drugs was presented in a paper by L. L. Watters. The speaker thought that adulteration and misbranding of these materials was on the increase, and gave illustrations of food adulteration, the adulterants employed, and the extent of adulteration, especially in New York City. He suggested that the greatest need was not for legislation, but for the enforcement of the laws now on the statute books. In discussing this paper H. W. Wiley called attention to the need of further legislation in some States, and illustrated some of the advantages which might be expected to result from the enactment of a National pure-food law.

C. A. Crampton and F. D. Simons presented a paper on The Detection of Palm Oil when Used as a Coloring Material in Fats and Oils. These oils are sold to the trade as "butter oil," to be used in the manufacture of oleomargarine, the palm oil being added to give the desired butter color. For its detection the speaker had employed two methods. In the first test the solution of fat in petroleum ether is treated with weak potassium hydrate solution, the water layer acidulated and treated with carbon tetrachlorid. The latter solution is separated and a portion treated with a solution of 1 part crystallized phenol in 2 parts carbon tetrachlorid, and then with hydrobromic acid. In the other test the melted and filtered fat is shaken with acetic anhydrid, and then with a drop of sulphuric acid sp. gr. 1.53. In both tests palm oil is indicated by a bluish-green color. The tests were found to be positive and satisfactory. A paper on The Detection of Process or Renovated Butter, by the same authors, confirmed Patrick's methods based on the microscopic examination of the curd. The behavior of the curd toward coloring matter, as suggested by Fascetti (E. S. R., 16, p. 196), has proved a favorable means of detection. The use of the Zeiss immersion refractometer is being studied.

In a paper on The Organic Matter in Soils, F. K. Cameron reported data in support of his method announced a year ago (E. S. R., 15, p. 744). He also presented notes on The Water of Utah Lake, showing the increase in solids during a period of years; and in the section for physical chemistry he reported upon The Solubility of Calcium Sulphate in Solutions of Ammonium Salts and of Certain Other Salts, in collaboration with B. E. Brown, on The Action of Water upon Calcium Phosphates, with A. Seidell, and on The Action of Solutions of Potassium Nitrate upon Tricalcium Phosphate, with J. G. Smith. A. S. Cushman described The Effect of Water on Rock Powders.

In the section for mechanical science and engineering, Elwood Mead, of this Department, discussed The Value of Courses in Agricultural Engineering; C. G. Elliott described the irrigation and drainage investigations of this Office; and C. J. Zintheo, of Iowa, sent a paper on American Machinery as a Factor in Agriculture.

Accounts of the meetings of several other affiliated societies are given in the following pages. Unfortunately it was not found practicable to secure reviews of the papers read at the meeting of the Society for Horticultural Science.

Society for the Promotion of Agricultural Science.—This society met in Philadelphia December 27 and 28. A joint session was held on the first day with the Society for Horticultural Science, at which the addresses of the presidents of the two societies were presented. These addresses were treated editorially in the last number.

A memorial to the late Henry E. Alvord, a member of the Society for the Promotion of Agricultural Science, was presented by W. R. Lazenby, on behalf of a committee consisting of himself, L. O. Howard, and W. J. Beal, appointed for the purpose. This was a record of the life and scientific services of Major Alvord, and concluded

with a tribute to his judgment and integrity, and to the personal qualities which endeared him to a wide circle of friends.

In a paper on The Part Taken by Teleutospores and Æcidia in the Distribution of Maize and Cereal Rusts, J. C. Arthur pointed out that corn rust is exceptionally well fitted for studying the spread of rusts on cultivated crops. He showed that this rust is spread chiefly by uredospores, starting in the spring largely from uredospores blown in successive stages from warm regions of the South. It occasionally begins still earlier and more vigorously by the germination of overwintered teleutospores, first producing a crop of æcidial spores on wild plants of the Oxalis genus, which in turn infect the corn plant. The appearance of rust on a plant does not imply that the source of infection is near by, for spores of some species of rust, notably those of cultivated crops, may be blown long distances without losing vitality.

. F. M. Webster traced The Early History of the Hessian Fly in America. He recalled that the name was applied to it because of its supposed introduction into this country in straw which the Hessian troops brought over from their native country in 1776 and 1777, although there was said to be no proof that at that time the Hessian fly inhabited Hesse or any part of Germany. The writer considered it improbable that the fly was introduced through the Hessians, since records show that within a few years after that date the insect was present in sufficient numbers to devastate the wheat fields. Proof of the actual existence of the Hessian fly in America prior to 1776 was said to be lacking, although frequent references to depredations of "the fly" were cited. The writer leaned to the belief that the Hessian fly was accidentally introduced into America from Southern Europe at some time prior to 1776, making its appearance first on Long Island and Staten Island in the vicinity of New York, and that it first became a pest in that locality in 1779, receiving its present name about that time.

Regarding the subsequent diffusion of the Hessian fly over the United States, "all that can be safely said is that the pest has followed closely in the wake of wheat culture across the country from east to west, appearing in a community even before wheat growing became an important industry," and remaining unobserved until it became a serious pest. Like many other insects, it is carried comparatively long distances by the winds and may in this way be spread beyond its supposed area of distribution. For this reason the exact date of the appearance of the insect in a particular locality can not be substantiated.

Economic Methods of Restocking White Pine Forests was the subject of a paper by F. W. Rane. He described an experiment in restocking a piece of land at the New Hampshire Agricultural College, using seedlings which were dug up in various localities about Durham. Twenty-two thousand of these seedlings were transplanted. The cost of digging the 3-year-old seedlings is estimated at about 75 cents per thousand. It was found that two men could set on an average about 400 seedlings an hour, at a cost when set 8 by 8 feet apart of approximately 50 cents per acre for transplanting, thus making the total expense of digging and transplanting approximately $1.25 a thousand. This is regarded as cheaper than nursery stock, and to place beyond question the economical restocking of lands adapted to the growth of white pine.

In a paper on The Vitality of Seeds, W. J. Beal gave the results of experiments begun nearly 25 years ago on the length of time which seeds of some common plants would remain dormant in the soil and yet germinate when exposed to favorable conditions. Samples containing 50 seeds of each of 22 different kinds of plants were mixed with moderately moist sand taken from 3 feet below the surface, placed in bottles, and buried with the mouths of the bottles uncorked, and slanting downward in a sandy knoll. At the end of 5, 10, 15, 20, and 25 years tests were made of the vitality of these seeds, the results of which were detailed. Eight out of 22 kinds of seed tested failed to germinate at either trial, while of the other 14 species 10 germinated after they had been buried 25 years. Differences were noticeable in the readiness with which equally sound seeds of the same species germinated.

C. S. Plumb, of Ohio, sent a paper on Prolificacy of Sheep Breeding. S. M. Tracy, now connected with the Bureau of Plant Industry of this Department, spoke upon cassava growing in the Gulf States; and L. H. Pammel, of Iowa, described Some Fungus Diseases in Iowa in 1904.

The officers elected for the ensuing year were Dr. H. P. Armsby, of Pennsylvania, president, and Prof. F. W. Rane, of New Hampshire, secretary and treasurer.

Association of Economic Entomologists.—The seventeenth annual meeting of the Association of Economic Entomologists was held at Philadelphia December 29 and 30, 1904. The session was opened with an address by the president, Prof. A. L. Quaintance, of the Bureau of Entomology of this Department, entitled Some Present Day Features of Applied Entomology in America.

The speaker traced the development of interest in economic entomology, alluding to the discovery of the connection between mosquitoes and the dissemination of malaria and yellow fever, the invasion of this country by the San José scale and the boll weevil, and other economic insects. These things have aroused much interest in applied entomology, and have resulted in an attempt to popularize it and give it an important place in nature study. There are now in this country about 145 men devoting more or less of their time to economic entomology, and if those engaged in nursery inspection are included the number is easily doubled.

Entomological investigations are being conducted in 43 of the experiment stations, and there are now 59 workers in this field in the Bureau of Entomology. These men have an aggregate appropriation of $280,000 annually, aside from special appropriations for such pests as the boll weevil, gypsy moth, etc. The investigations in economic entomology were credited with having saved $20,000,000 to growers of orchard fruits alone, and to the country at large of about $155,000,000.

The wide range of the investigations of economic entomologists was illustrated by the importation of the fig insects, giving to California a most valuable fruit industry, and the study of malaria, mosquitoes, aquatic insects, etc., besides investigations of many forms depredating agricultural crops. General legislation has been directed mainly against the San José scale, and latterly special laws have been enacted for the purpose of checking the boll weevil, and Texas now proposes to enforce some radical measures for the control of this pest.

In a paper by E. P. Felt, of Albany, on Experiments with Lime-Sulphur Washes, he stated that the results were uniformly successful, and gave a formula and method of preparation of a new sal soda-lime-sulphur wash he has recently devised. In discussion, J. B. Smith stated that lime-sulphur washes had been very ineffective on apple and pear trees in New Jersey, whereas upon the peach results were more satisfactory. The same was reported for portions of eastern Pennsylvania. M. T. Cook, of the Cuba Experiment Station, described some Cuban insects, mentioning in particular a leaf cutter ant which is a serious problem, since it sometimes defoliates small trees in a single night. As a means of control he suggested scattering Paris green about the entrance to the nests, a measure which promises to be of considerable service. In a paper entitled Further Observations Concerning the Cotton Boll-Weevil, E. D. Sanderson pointed out a benefit of the cottonworm in that its depredations result in reducing the amount of food available for weevils.

S. A. Forbes presented a paper on Spraying Apples against the Plum Curculio, and brought forward data to show that 4 sprayings give the maximum benefit. The cost of treating 492 trees was from 4 to 5 cts. each, or 16 to 17 cts. for the four treatments, only 2 cts. of which could be charged to material. As a result, the yield of fruit was increased by about one-half and its size by one-fifth, and its value was doubled or trebled. C. L. Marlatt presented a brief paper upon the value of copper sulphate for the destruction of mosquito larvæ, showing that one part to a million in pure water killed larvæ about one-third grown in from 2 to 3 days; copper foil was also destructive. The full-grown wigglers, however, required fully 1 part to 40,000, and

in foul water even more was necessary. J. B. Smith stated that in his experience even greater strength was necessary to secure satisfactory results. W. E. Britton, of Connecticut, presented a brief paper showing that the fall webworm was partially double-brooded in Connecticut; and Henry L. Viereck, of Philadelphia, gave a few observations upon the museum pest.

The Coffee Leaf Miner (*Leucoptera coffeella*) was discussed by M. T. Cook. This is one of the most injurious coffee pests in the West Indies and causes great losses in Cuba and Porto Rico. On some coffee estates 56 per cent of the leaves were affected. The life history of the pest was discussed by the speaker with particular reference to methods of treatment. Spraying against the larvæ in the leaf is of little avail. It is found possible, however, to control the insect quite thoroughly by repeated spraying against the pupa by means of kerosene emulsion containing 1 part kerosene, 1 part whale-oil soap, and 8 parts water. When numerous applications of this remedy were made, slight injury to the leaves occur, but this injury was not of great importance. On the grounds of the Cuban Experiment Station spraying experiments were begun August 18 and continued to November 5 at frequent intervals. The results of this experiment indicate that the treatment is quite effective.

Some notes on the Fumigation of Household Insects and their Eggs with Hydrocyanic-Acid Gas was the title of a paper by J. L. Phillips. Fumigation with hydrocyanic-acid gas was tested in the destruction of bedbugs in living apartments. The buildings were badly infested. The doors were kept closed for 2 days, at the end of which time it was found that all fumigated eggs were dead. Repeated examinations of the apartments disclosed the presence of very few living insects, and fumigation is, therefore, considered effective for bedbugs. Good results were also obtained from the use of the same method in destroying the croton bug in dwelling houses.

A. F. Burgess read a paper on The Fumigation of a Fruit House for Controlling the Codling Moth. Since many larvæ of the codling moth do not leave the fruit until it is in storage, it appeared desirable to test the effect of fumigation with hydrocyanic-acid gas upon codling moth larvæ in storage rooms. In the experiment reported by the speaker the larvæ were in a fairly active condition and were thoroughly exposed to the action of the fumes. The formula used was 1 oz. of potassium cyanid, 1 fluid oz. of sulphuric acid, 3 fluid oz. of water for each 100 cu. ft. of space. The period of fumigation was 20 hours. At the end of the period the odor of the gas was still quite strong in the storage house. An examination was made of numerous larvæ with the result that less than 45 per cent appeared to have been killed by fumigation. Some of these larvæ were injured by handling, so that the speaker believes that really less than 40 per cent were killed by the treatment. The cost of the treatment was so slight that it would be an economical method if effective. Apparently, however, it is not sufficiently effective, and it was recommended that screens be used in storage houses for capturing the moths.

The Cottony Maple Scale, an Unusual Outbreak, and Experiments with Insecticides was discussed by S. A. Johnson. The speaker's experience with this pest was had chiefly in Denver. Several kinds of insecticides were used as winter treatment, especially since it appeared that remedies could best be applied in the winter. A number of preliminary laboratory experiments were made in testing the value of lime-sulphur-salt wash, kerosene emulsion, and whale-oil soap in destroying the cottony maple scale. Apparently the natural mortality in this species is about 50 per cent during winter. The results obtained in laboratory experiments with insecticides were not decisive. Outdoor applications were made in Curtis Park, Denver, during which kerosene emulsion, tobacco decoction, skabcura, tree soap, zenoleum, lime-sulphur-salt, whale-oil soap, etc., were used. The most effective remedies as determined by these experiments are kerosene emulsion in various strengths above 10 per cent, and whale-oil soap at the rate of 1 lb. to 1 gal. of water. Tobacco decoction, skabcura, and lime-sulphur-salt wash appeared to be quite ineffective.

H. E. Weed discussed insecticide remedies for the same insect, from experience in the parks of Chicago where the pest has prevailed extensively since 1886. Notes were given on the plants which it may infest. Spraying was begun in July and continued until September. At first, kerosene emulsion was used, beginning with an 8 per cent strength and gradually increasing to one of 15 per cent. The 8 and 10 per cent emulsions apparently had no effect upon the insects, while about 50 per cent were killed by the $12\frac{1}{2}$ per cent strength. When a 15 per cent kerosene emulsion was used, the majority of the scale insects were killed, but nearly all of the leaves were destroyed on box elder, linden, and maple.

W. E. Britton and H. L. Viereck presented a paper on the Insects Collected from the Flowers of Tree and Bush Fruits. Insects were collected by the speakers during sunny forenoons on the grounds of the experiment station at New Haven, between May 4 and May 14, on various fruits including gooseberry, red currant, black currant, Japan plum, sweet cherry, apple, pear, and blackberry. In all 2,027 insects were captured belonging to 278 species. It was not determined whether there were any swarms of the common honeybee in the neighborhood, but determination of species collected showed it to be an exceedingly rare visitor on the experiment station grounds, only 3 specimens being captured and those only on the apple. The most numerous insect visitors belonged to the hymenopterous families Halictidæ and Andrenidæ, especially sweat bees. *Chloralictus sparsus* was the most abundant species.

The Importation and Breeding of Various Types of Honeybees was discussed by F. Benton. Attention was called by the speaker to the differences in anatomy, temperament, and industry among different races of bees, and a historical statement was presented regarding the importation of various races of bees into this country. The characteristics of black bees, Italians, Cyprians, Carniolans, and Caucasians were studied in considerable detail. Notes were also given on methods by which desirable traits in bees may be secured by cross breeding. It appears that in crosses among bees the temperament is inherited from the drone and the extent of industriousness from the queen. On this basis it is believed to be possible to secure valuable crosses between Cyprians and Caucasians, or between Cyprians and Carniolans.

C. L. Marlatt gave a brief description of the conditions of infestation by the gipsy moth at the close of the important work carried on by the Gipsy Moth Commission of the State of Massachusetts in 1900, followed by an account of the slow increase of gipsy moth damage up to 1902. The very rapid increase of gipsy moth work since 1902 was described in some detail, based on a careful examination of the whole territory made by Mr. Marlatt during the month of July, 1904. It was shown that, while the range of the gipsy moth had not greatly increased, the abundance of this insect and the amount of actual defoliation was greater in 1904 than at any previous time in the history of the insect in America. A map was exhibited showing the actual distribution of the gipsy moth about Massachusetts, and also in the city of Providence, R. I., the only point at any distance from Boston where it has appeared. Suggestions as to the more practical means of control were made, and it was urged that the experiment be tried of introducing foreign parasitic enemies of this insect. The present distribution of the brown-tail moth was detailed, and suggestions as to means of control and the introduction of natural enemies were made.

E. D. Sanderson spoke upon the Amount of Injury from the Cotton-Boll Weevil, and A. L. Quaintance discussed The Cotton Bollworm.

Notes upon the insects of the year were read by Messrs. Osborn of Ohio, Fletcher of Canada, Felt of New York, Washburn of Minnesota, Conradi of Texas, Newell of Georgia, Burgess of Ohio, Gillette of Colorado, and Martin of Tennessee, which brought out a number of interesting and valuable points.

The officers elected for the ensuing year were: H. Garman, of Kentucky, president; E. D. Sanderson, of New Hampshire, and F. L. Washburn, of Minnesota, vice-presidents; and H. E. Summers, of Iowa, secretary-treasurer.

The Mutation Theory and Animal Breeding.—At the conference of the American Society of Naturalists, held at Philadelphia during the meeting of the American Association, Prof. W. E. Castle presented a paper on The Mutation Theory of Organic Evolution from the Standpoint of Animal Breeding. He stated at the outset that the mutation theory was not designed to replace Darwin's theory of natural selection, nor was it capable of doing so. Natural selection must still be invoked to choose between different organic forms, preserving the more efficient and destroying the less efficient. The question raised by this new theory is, What sort of forms are subjected to the action of natural selection? Is there a complete gradation of forms between two extreme conditions; and is natural selection called upon to choose from the whole series the one which is organically most efficient, or is the choice made merely between two widely separated conditions of ideal series? Have the variations in size within a species diverged by gradual cumulation of minute differences in size, or by a single step? These alternative views are known, respectively, as the selection and the mutation theory.

It was pointed out that Darwin recognized no essential differences between breeds and species, and believed that from a knowledge of how breeds originated much may be inferred as to the origin of the species. To this end he made extensive studies of breeds of animals, as well as of plants. What we need to know, the speaker said, is how precisely are new breeds formed. Although they are formed under our very eyes, the method eludes us. "The successful practical breeder, the man who originates breeds, is a keen observer, a man of unusual intelligence and skill and of infinite patience. Yet if we ask him how in general he does his work or how a particular result was obtained, we rarely get a satisfactory answer. While he often withholds this information for commercial reasons, more often it is because the breeder himself does not know how the result was attained. The record of his breeding gives little information as to the real nature of the material used and the processes involved in the formation of the breed."

For the biologist to solve the problems involved in the formation of breeds, it was urged that he must himself turn breeder and see new organic forms arise out of material which he is thoroughly familiar with, and under conditions which he can control. Little work of this sort has yet been done, and generalizations can as yet be made only tentatively. So far as the evidence goes, it was said to indicate that the material used by breeders for the formation of new breeds consists almost exclusively of mutations. "The breeder does not set to work with some purely imaginary form in mind toward which he seeks by selection gradually to mold his material. He commonly either discovers the new breed already created and represented by one or more exceptional individuals among his flock, or else he seeks by crossbreeding to combine in a single race characters which he finds already existing separately in different races. In both cases he deals with mutations, that is, with characters unconnected by a series of transmitted stages with the normal form."

Illustrations were given from the author's own experience in breeding guinea pigs. In three generations he was able to establish a race with a well-developed fourth toe on either hind foot. This was not created by selection, but was improved by that means; it was born and not made—a mutation. Similar results were observed in breeding long and short haired guineas. If these results had taken place in nature, natural selection would have followed to determine which was best suited, and the different breeds would have been geographically separated.

The combining in one race of the characters already found in different races, by means of crossbreeding, was shown to depend upon the facts that (1) mutations are alternative in heredity to the normal condition, and (2) one mutation is entirely independent of another in heredity. From the array of forms obtained, the breeder can select the particular combination of characters which suits his purpose. Cross-

breeding, it was stated, sometimes facilitates the creation of desirable breeds, for it serves to induce new mutation, which in some cases is progressive, in others regressive.

"On the whole, it appears that the formation of new breeds begins with the discovery of an exceptional individual, or the production of such an individual, by means of crossbreeding. Such exceptional individuals are mutations. An examination of stock registers points in the same direction." The few generations which the breeder usually employs in "fixing" or establishing the breed, and during which he practices close breeding, serve principally to free the stock of undesirable alternative characters, not to modify the characters retained. "Modification of characters by selection, when sharply alternative conditions (i. e., mutations) are not present in the stock, is an exceedingly difficult and slow process, and its results of questionable permanency."

In so-called improved breeds, supposed to have been produced by this process, it was stated as more probable that the result represents the summation of a series of mutations rather than of a series of ordinary fluctuating variations; for mutations are permanent, while variations are transitory. "Mutations have an internal origin in the hereditary substance itself. They are relatively independent of the environment, being affected only by such causes as affect the nature of the hereditary substance itself, one of which apparently is crossbreeding."

The closing paragraph of the paper suggests a line of research. The writer says: "There are, however, frequently found in breeds of domesticated animals conditions which are not sharply alternative in heredity to the corresponding characters of other breeds. It is an open question whether such conditions could be maintained if crossbreeding were freely allowed with animals of a different character. If not, they could scarcely become racial characters under the action of natural selection. The race would then become, not sharply dimorphic or polymorphic, as is the case where inheritance is sharply alternative, but subject to extremely great fluctuating variations. It is an open question whether blending characters of this sort, found in many breeds, may not have been created by selection from masses of fluctuating variations. It will be important to know further whether or not these extreme fluctuating series have had their origin in mutations."

American Forest Congress.—This congress, held in the National Rifles Armory and National Theatre, at Washington, January 2–6, was attended by about 800 delegates in addition to numerous visitors. The meetings were held under the auspices of the American Forestry Association. Altogether, about 50 papers were read and discussed, in addition to a number of addresses by Members of Congress, foreign representatives, and men prominent in National affairs.

Several things conspired to make the congress the most important one of its kind ever held in America. It was to a large extent a congress of forest users. There was great interest and enthusiasm throughout the meetings, due in a measure to the mere presence of numbers of delegates and visitors interested in the general problems of forestry. Distinguished representatives of all branches of industry and science which are intimately concerned in the preservation and use of the forest were gathered together for the discussion of ways and means. The programme of the meetings was arranged in a natural and logical sequence, in order to allow these cooperative factors to be properly presented. There were special sessions devoted to the relation of forest lands to irrigation, lumber industries in the forests, grazing industries in the forests, the relation of railroads to the forests, forest lands and mining, and National and State forest policies. Irrigation experts, foresters, lumbermen, stock raisers, railroad presidents, miners, and forest supervisors all met on common ground and discussed the problems in which each was most concerned in such a manner that the desire of cooperation between all these factors was apparent.

The keynote of the congress was sounded by the President in his address at the National Theater. This was that the forests are to be preserved for use. It was

argued that the importance of preserving the forests is admitted by forest experts and finds expression in public opinion throughout the country. This, however, is not sufficient to protect the forests in an effective manner. In order to secure this protection, it is necessary that the great business and forest interests of the nation join forces. The movement for the protection of forests should not, in the President's opinion, come from the Government, nor from newspapers, nor from public sentiment alone, "but from the active, intelligent, and effective interest of the men to whom the forest is important from a business point of view."

Throughout the sessions of the congress, papers were presented which showed clearly a change of attitude on the part of all persons concerned toward the use and preservation of the forests. Lumbermen, railroad men, and miners, all recognize more clearly than ever before the necessity of preserving such forests as already exist and of making forest plantations wherever favorable conditions prevail. Such work has already been undertaken on an extensive scale by certain railroads, and other railroads have installed large plants for the preservation of ties and other timbers so as to increase their durability. In former years these industries were prone to look upon any restriction upon their use of forest lands as an unjust discrimination. They now recognize the necessity of an intelligent control of all forest products for present or future use. A similar change of attitude has occurred among stock raisers who wish and claim the right to use the grazing lands in the forest reserves, so far as this may be done without injury to standing timber and without preventing the reproduction of the forests. Likewise on the part of forest experts, the desire was expressed for a cordial cooperation with all business interests concerned in forest production, to the end that the forests may be preserved from unnecessary waste and that the supply of timber for the future may be assured.

The intimate relationship between the forests and general agricultural operations was also clearly recognized by various speakers. Without reaching definite conclusions regarding the question whether forests influence the actual amount of rainfall or not, it was generally recognized that the forests everywhere exert a decidedly favorable influence upon the regulation of the water supply, especially during the time of the minimum discharge. This influence is of great importance not only for the irrigation farmer but also for the mining and milling industries which may depend upon water for power. All the speakers strongly recommended that in order to secure the best results from forest reserves and other public timber lands, these lands should be placed under the management of the Bureau of Forestry.

Miscellaneous.—A note in *Science* states that Luther Burbank, of California, has been appointed a special lecturer at Stanford University.

William H. Krug, for many years an assistant in the Bureau of Chemistry of this Department, and latterly connected with a business firm in New York, died in that city from pneumonia on January 27, after only a few days' illness. His remains were brought to Washington for interment.

C. P. Lounsbury, government entomologist of Cape of Good Hope, and Claude Fuller, the Natal government entomologist, have been commissioned by their respective governments to visit Brazil to investigate and, if possible, obtain the parasitic and predaceous enemies of the fruit fly (*Ceratitis capitata*), which Compere reports in that country.

It is learned that Prof. F. Tangl, of Budapest, did not accept the call to the chair of physiology at Innsbruch, announced in a recent issue (p. 420).

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EXPERIMENT STATION RECORD.

VOL. XVI. MARCH, 1905. No. 7.

Provision for the continued growth and extension of the National Department of Agriculture is made by the agricultural appropriation act passed by Congress near the close of the session. The total amount carried by the new appropriation is $6,692,690, exclusive of a special appropriation of $190,000, "to meet the emergency caused by the ravages of the Mexican cotton-boll weevil and other insects and diseases affecting cotton, to study diversification of crops, and improve cotton by breeding and selection in the Southern States." Excluding this emergency appropriation, the act provides an apparent increase of $790,650, the largest increase ever given the Department in any one year.

A considerable part of this increase arises from the transfer of the administration of the Federal forest reserves to the Bureau of Forestry, and the reorganization of the forest service. Since the first national forest reserves were created in 1891, they have been under the management of the General Land Office of the Department of the Interior. The bill providing for their transfer to this Department was signed by the President February 1, and took effect immediately. The force of superintendents, supervisors, rangers, and clerks connected with the management of these reserves included over 500 persons, who have now been transferred to the Bureau of Forestry, together with the unexpended balance of the appropriation for their maintenance.

There are unusual difficulties this year in making direct comparisons between the new and the old appropriations in the case of the different Bureaus, owing to a readjustment of the salary rolls. The entire clerical force has now been placed upon the so-called statutory roll, which carries a specific appropriation for each clerical position under the Bureau or Division where employed. The scientific force, on the other hand, is now separated entirely from the statutory rolls and paid from the lump sum appropriation for each Bureau or Division, the salary to be fixed by the Secretary, but in no case, except administrative officers, to exceed $3,000.

The Weather Bureau receives a total of $1,392,990, an increase of $55,250 over last year. Of the total appropriation, $725,480 is specifically mentioned for salaries for the local force and the observers and other employees throughout the country, although this does not include the entire salary roll, the maintenance of the printing office of the Bureau, for example, and certain other employees being provided out of the fund for general expenses. There is a provision of $88,000 for the construction of Weather Bureau buildings, cables, and telegraph lines; and a penalty is fixed by the act for counterfeiting weather forecasts or warnings which are represented to have been issued by the Weather Bureau.

The largest increase for any single line of work is for the Bureau of Animal Industry—$177,120. The total for the Bureau for the next year is $1,540,000, the principal increase being for its inspection work and the laboratory investigations connected therewith. The item of $25,000 for experiments in animal breeding and feeding in cooperation with the experiment stations, which was introduced last year, is continued.

The total appropriation for the Bureau of Plant Industry is $776,880, an apparent increase of $32,450. A new clause carries an appropriation of $25,000 for special investigations, in cooperation with the experiment stations, on grain growing, including the development of varieties suited to the semiarid districts and high altitudes, increasing the hardiness of winter grains to enable their farther extension northward, determination of methods of culture for different districts, and studies upon the cause of deterioration of grain from the milling standpoint, and the conditions affecting the quality of grain when stored and in transit. All of the lines of work provided for in the previous appropriation are continued. These include, in general, investigations in vegetable pathology and physiology, pomology and the handling of fruit, botany, grasses and forage plants, farm management, tea culture, plant introduction, the production of domestic sugar, and the operation of the Arlington Experimental Farm.

The appropriation for the Forest Service, including the management of the forest reserves, is $875,140, and the act defines the duties of the Bureau of Forestry in the policing and administration of these reserves. This is $450,000 more than the Bureau received this year, and as the amount appropriated for the forest reserves last year was $375,000, there is an evident increase of about $75,000 for the other work of the Bureau.

The Bureau of Chemistry receives $155,000, an increase of about $5,000, the item for investigations relating to table sirup being reduced from $15,000 to $3,000. The appropriation for the Bureau of Soils is practically $10,000 less than last year—$204,660; and that for the Bureau of Entomology is increased $2,000, making $84,470;

while the Biological Survey is raised to the grade of a bureau and given a total of $52,000, a slight increase. The Bureau of Statistics receives practically the same as last year, $196,460.

The Office of Experiment Stations is given more definite standing in the agricultural bill than previously, the various appropriations assigned to it being grouped together under it, making a total appropriation, including that for the experiment stations, of $917,900. There is a small increase for the Office proper, an additional $3,000 for the Alaska Experiment Stations, "for the purchase and introduction of live stock for experimental purposes," and an increase of $10,000 for the irrigation and drainage investigations. The wording of the appropriation for the latter purpose is broadened to include studies upon the use of different kinds of power and appliances for irrigation, drainage, and other agricultural purposes. This will enable the Office to take up studies in agricultural engineering which have been in contemplation for the past two years.

In the case of the Division of Publications there is an increase of $6,000, which is apparent rather than real, and is accounted for by the readjustment of the clerical force. The total amount for next year is $246,620. This includes the allowance for Farmers' Bulletins, amounting to about $100,000, but as usual does not include the fund available for printing the other miscellaneous bulletins of the Department. This comes out of the general printing fund, which amounts to over $6,500,000, the Department's allowance being $185,000, including $25,000 for the Weather Bureau. Aside from this, $300,000 is set aside for the Department Yearbook, and the annual and special reports to Congress are provided for specifically. All told, the expenditures for Department printing aggregate nearly or quite $850,000 a year.

The Office of Public Roads is given an increase of $15,000, the total now being $50,000, and the scope of its work is enlarged to include investigation of the chemical and physical character of road materials (now carried on under the Bureau of Chemistry), and to furnish expert advice on road making. The total amount provided for the Office of the Secretary and for contingent expenses of the Department is $147,320, and in addition the Division of Accounts and Disbursements receives $32,110 and the Library $21,040.

The funds for the erection of the new Department building are not carried by this appropriation. The work of excavating for the two wings has been in progress during the winter, and although somewhat delayed by the weather, is now practically completed. A small section of the building, showing the full height, has been constructed of wood and staff to give an idea of its proportions and general appearance. The growth of the Department makes the need of the new quarters

more imperative every year, and the amount now required for rent makes serious inroads upon the revenues.

The rapid progress of irrigation in this country, and the present magnitude of the systems and enterprises involved in irrigated agriculture, constitute one of the most remarkable features in the history of agricultural development in the world. Although the statistics regarding it were presented by the Census in 1899, its growth is so rapid that Congress last year ordered these data to be brought down to the close of the crop year of 1902, and this has been done in a bulletin recently issued by the Census Bureau, entitled, Irrigation in the United States, 1902. This bulletin brings out many striking facts regarding the number and extent of the irrigation enterprises in the Western States, the enormous amounts of money involved in their construction, and the trend of development.

Beginning, as far as English speaking people are concerned, with the use of water in rice culture about the year 1700, and confined for a century and a half to the coast of the Carolinas and Georgia, the bulletin traces the successful application of irrigation in the arid region by the Mormons in 1847, and by the pioneers of California who utilized abandoned mining ditches for watering small tracts. Gradually, with the increase of irrigation and of population, large systems became necessary, and the construction of these led to an extension not only of the area but the scope of irrigated agriculture. The success of the Greeley Colony in Colorado, established in 1870, gave a great impetus to irrigation throughout the arid region. During the past twenty years there has been an awakening to the opportunities afforded in that region and a remarkable transformation in many parts of it. At present approximately 10,000,000 acres are irrigated in the arid and semiarid regions, upon which crops valued at a hundred million dollars a year are grown.

In the year for which the data were gathered for the recent Census bulletin, irrigation was practiced on 134,036 farms in the United States, an increase of more than 20 per cent over the returns for 1899. This increase represented an addition of about 1,705,000 acres, which has been brought under irrigation systems at a cost of nearly $22,000,000.

The total area under irrigation is reported as 9,487,077 acres. Colorado is placed at the head of the list with 1,754,761 acres, which is nearly equaled by California. Montana stands third in irrigated area, with over a million acres, Wyoming fourth, and Idaho and Utah fifth, with approximately 713,600 acres each. The construction cost of the irrigation systems for supplying the necessary water aggregates $93,320,452, or $9.84 an acre for the whole country. The main canals and ditches for carrying the water to the land, exclusive of those for rice irrigation, have an aggregate length of 59,311 miles, which would

be sufficient to reach nine times across the continent and back, or more than twice around the globe.

These data, however, are now two years old, and in some cases already in need of revision to bring them up to date. More recent returns show that in California over 2,000,000 acres are now being irrigated, and other States have shown material increase. The figures given for the length of main canals and ditches represent only a fraction of the total length of all irrigating ditches, since many of the branches are three or four times as long as the main canal. The cost also is far below the full expenditures made in reclaiming, there being large numbers of ditches for which there is no official record. Moreover, the Census Bureau's figures include only the cost of the irrigation systems themselves, and do not include the expenditures for removing brush, building laterals, and grading land, which precede irrigation. The cost of these items, according to the statistics gathered by this Office, has varied from \$5 to \$30 an acre, making it certain that the total expenditure in providing for the watering of land irrigated by private capital in this country is over \$200,000,000.

While irrigation is spreading very rapidly in the semiarid regions and in the rice States, and also to some extent in the humid States, nearly 90 per cent of the acreage under irrigation at the time covered by the Census report was in the States and Territories comprising the arid region. From 1889 to 1902 the greatest relative increase was in the rice States, there being a gain of 74 per cent in the number of farms irrigated and 141 per cent in the irrigated area. The cost of irrigation system in the rice States is given as approximately \$10,196,000, or twice that of the systems in the semiarid States and Territories.

The main source of water supply is, of course, from streams, which water 96 per cent of the irrigated country. The other 4 per cent is reported as irrigated from springs and wells, about 70 per cent of the area irrigated by wells being in the arid region. While the average construction cost per irrigated acre was \$9.84 for all systems and sources of water, the cost was \$9.31 for systems supplied from streams, \$5.23 from springs, and \$29.40 from wells. There was great variation, however, in different sections of the country, the expense in the humid States being much in excess of that in the arid and semiarid regions.

Since 1902, the date for which the Census figures on irrigation were collected, the extension of irrigation and settlement of the arid lands under private auspices has gone on more rapidly than ever before. This is true notwithstanding the passage of the National Irrigation Act, providing for the construction of irrigation works with public funds, and the organization of the Reclamation Service. The widespread publicity given to the enterprise and the increased faith in the development of the arid country by irrigation have evidently stimu-

lated the investment of private capital in increasing amounts, instead of the prospect of Government aid exercising any retarding influence.

In 1903 and 1904 work was begun under private enterprise on 1,093 ditches in the State of Colorado, and filings were made for 392 reservoirs. During the same period applications for more than 500 new ditches and canals were made to the State engineer of Wyoming. In Idaho, during about a year and a half within this period, 1,285 new applications for permits to use water were received, and 900 permits were issued. In other States there was likewise rapid growth in the demand for water and in the development of enterprises to furnish it.

The development of irrigation thus far, it will be observed, has been under private enterprise. The National Government has not irrigated any land except a few acres on Indian reservations, but the Reclamation Service has recently announced projects for the construction of reservoirs with the reclamation fund which will affect about 1,131,000 acres. The fifteen projects announced as approved, several of which are now under construction, will involve an estimated cost of $31,395,000, or an average of $27.26 an acre. This average varies in different cases from $18 to $35 an acre. The construction cost is to be repaid to the Government in ten annual installments, without interest, by the owners of the land reclaimed; and the fund is to be used over and over, together with the additions to it from the sale of public lands. The fund now amounts to nearly $25,000,000, the proceeds from lands having accumulated since 1901. It is thus more than one-fourth as much as the total construction cost of the irrigation systems given by the Census bulletin up to the close of 1902.

The development of irrigation brings with it a multitude of problems which increase in variety and importance as the land becomes settled and the capacity of the water supply taxed to a greater extent. Many of these problems lie at the very heart of practical irrigation. The relations between farmers under irrigation are far closer and more intimate than under the conditions of farming in the East, and the community of interest is necessarily much more in evidence. One man may ruin his neighbor's land by improper management of his water, and the continued waste of water prevents the bringing of new areas under cultivation and thus restricts settlement.

Irrigation farming is usually intensive farming, as indicated by the fact that the average size of the farms in the irrigated States is about 70 acres. The management of this more intensive system requires superior intelligence, and affords unusual opportunities for error. To a large extent the practice is based on rule-of-thumb methods developed out of costly experience, and does not rest upon a scientific basis, because until recently there has been relatively little investigation of the strictly agricultural phases. One outcome of the studies which

have been made has been to show how irrational and ill advised some of the practices are, and how diametrically opposed to the common good and the fullest development of the country with the water supply in sight.

Hence, the strictly agricultural phases of irrigation, those with which the farmer has to deal after the main canals have been built and the water delivered at his boundaries, present a broad field for investigation, surpassed in importance by no other branch of agricultural inquiry and opening up great possibilities for usefulness. To this field the Department of Agriculture has addressed itself in the conduct of its irrigation investigations. It neither determines the water supply available for irrigation and other purposes nor constructs or operates irrigation work for reclaiming new areas. It directs its efforts primarily to studies on the utilization of water in agriculture, whether under private or public auspices, in order to determine how to make the most of the limited water supply available for irrigation, by using it to the best advantage in the production of crops. Closely related to these questions are problems growing out of the misuse of water, studies of the laws and institutions relating to irrigation, and the development of irrigation in the semiarid and humid regions.

The extent and character of the Department's irrigation work are shown by the recently issued report for the past year by Dr. Elwood Mead, the expert in charge. During the year studies were carried on in thirty States and Territories, and in the Hawaiian Islands and Porto Rico. This work was almost entirely in cooperation with the agricultural experiment stations, State engineers and other agencies, which fact helped to direct it along lines in which its aid was most urgently needed and to give wide publicity to the results of the studies.

Doctor Mead's report calls special attention to the increasing cost of water, which the farmer must have whether the cost is great or small. During the past five years this cost has risen enormously in nearly every western State. Certain water rights in Colorado, for example, which were originally purchased for $5 an acre, now sell for $35. Where formerly 50 cents an acre-foot for water would have been regarded as a prohibitive price, farmers last year paid $7 an acre-foot. Fully $20,000,000 was paid by irrigators last year for the water they used. In many cases, from lack of knowledge how to use the water economically, they wasted and misapplied enormous quantities, thereby injuring their crops and their land, and incidentally that of their neighbors through seepage.

During the investigations of the past few years many instances of overirrigation have come under observation, showing that the farmers were lacking in knowledge of the real needs of their crops and of the

deleterious effects of too much water on crops and land. With the restricted supply in many localities, the wasteful or unskillful use of water by one farmer often means that the crops of some other farmer must suffer because of it, or that land must remain uncultivated. The area farmed, the yield of crops, and the continued productiveness of the soil all depend on knowing how to use water aright, and on the establishment of laws and regulations to compel this when men know and refuse to heed.

The report states that during the past two years methods and apparatus which are the result of many years' study have been installed for carrying out original investigations to determine, with greater accuracy than is now known, the factors which influence the quantity of water needed, and to determine just what amount of water and what method of application under given conditions will give the best results. In explanation of this work it may be stated that about thirty different methods of applying water to field crops are now employed in this country, these being modifications of four systems, i. e., flooding, furrows, checks, and basins. In some experiments on a large scale water has been made to go nearly twice as far by more economical methods of applying, at the same time causing the roots of the crops to go deeper into the soil in search of plant food. Investigations of the method and time of applying water, the water requirements under various conditions of soil and cropping, and related questions are being carried on in a number of different localities.

The promotion of correct methods in new irrigation districts has received considerable attention. New districts are being settled by people inexperienced in irrigation who may be spared an expensive and often discouraging experience by working out some of their problems in advance, determining the cheapest method of preparing their land and the right method of applying water to it. Such pioneer work has been carried on with success in several districts, notably in California, and has brought very high commendation.

The best authorities agree that not over ten per cent of the arid region can be irrigated from streams. The development of the remaining ninety per cent depends in large measure upon obtaining water from some other source. Improvements in machinery have so lessened the cost of pumping that many farmers are now resorting to it where it is impossible to obtain water from gravity canals. The pumps employed range all the way from those operated by windmills pumping stations costing over $100,000 and discharging a stream up to 4 feet in diameter.

The pumping investigations carried on by the Department have included the collection of information regarding the actual results of

pumping where carried on by farmers, using different kinds of power, field and laboratory tests to determine the best method of installing and operating pumping plants, tests of different types of pumping machinery to determine their efficiency, and investigations in pumping water to supplement the other available supply. The information gathered will, it is expected, be of great service to pump makers in showing them what conditions must be met, and to farmers in showing them what kinds and sizes of pumps are best suited to their needs.

During the past five years irrigation has made a remarkable advance along the Gulf Coast. Tobacco and truck farms are being irrigated in Florida, sugar and rice in Louisiana and Texas. Nearly all the water utilized in this region has to be pumped, and more than $5,000,000 has been expended in pumping machinery within this period. The high cost of machinery and of the water lifted makes a knowledge of how to distribute and use it to the best advantage of special importance. It has also created a number of important legal and economic questions connected with the adjustment of rights to water from streams.

The irrigation work of the Department has had a steady, healthy growth, and the confidence and interest with which it is regarded are indicated by its cordial relations and the increasing calls for assistance. Because this work has a practical value and importance which appeals to those interested in the problems of irrigated agriculture, the Department has been able to secure steady increases in the appropriation for it, which started seven years ago with $10,000. The increase granted this year, together with the cooperation of several States and other agencies which have provided funds for the purpose, will enable a considerable extension of its work in this and the related field of drainage.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Manual of the chemical analysis of rocks, H. S. WASHINGTON (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., pp. IX+183*).—"The object of this book is to present to chemists, petrologists, mining engineers, and others who have not made a particular study of quantitative analysis, a selection of methods for the chemical analysis of silicate rocks, and especially those of igneous origin." In general these are such as have proved simple and reliable in the experience of the chemists of the U. S. Geological Survey and of the author.

The more important of the methods and some of the principal operations are described with greater explicitness than is necessary for the expert analyst. "In this way it is hoped that it will be possible for an intelligent student, with some knowledge of chemistry and a little analytical training, to be able to complete a satisfactory analysis of an ordinary silicate rock without personal instruction and after comparatively short practice."

The estimation of potash in soils, plants, and fertilizers, F. P. VEITCH (*Jour. Amer. Chem. Soc., 27 (1905), No. 1, pp. 56-61*).—A comparison of Moore's method (E. S. R., 10, p. 408) with the official method is reported. The results indicate that the former method is simple, rapid, accurate, and of wide applicability.

The determination of lime, A. W. B. (*Chem. News, 90 (1904), No. 2347, pp. 248, 249*).—Precautions to be observed in the accurate determination of lime by precipitation with ammonium oxalate are described, and the influence of the presence of various salts on the accuracy of the determination is discussed.

The determination of organic carbon in soils, J. H. PETTIT and I. O. SCHAUB (*Jour. Amer. Chem. Soc., 26 (1904), No. 12, pp. 1640-1642*).—Parr's method for coal,[a] substituting powdered magnesium for sulphur in the combustion was successfully used with all soils containing from 0.1 to 3.5 per cent of organic carbon.

The reduction of perchlorate in the wet way, B. SJOLLEMA (*Ztschr. Anorgan. Chem., 42 (1904), p. 127; abs. in Chem. Ztg., 28 (1904), No. 97, Repert. No. 29, p. 353*).—The reducing agent used is ferrous hydroxid, and the reduction is accomplished by boiling 0.4 gm. of the perchlorate for 3 hours in a glass flask in a paraffin bath with a solution of 40 gm. of ferrous sulphate and 25 cc. of sodium hydroxid solution of specific gravity 1.33, in 100 cc. of water. Twenty-five cc. of nitric acid (sp. gr. 1.32 to 1.33) is then added and the solution heated for a short time, when 25 cc. more of the same acid is added and the solution boiled for ½ hour. The solution is then made to definite volume and an aliquot titrated by Volhard's method.

Soils and soil analysis, F. HUGHES (*Jour. Khedir. Agr. Soc. and School Agr., 6 (1904), No. 4, pp. 138-142*).—A brief discussion is given of the value of mechanical and chemical analysis of soils. The methods used in the laboratory of the Khedivial School of Agriculture are outlined and some of the more important results obtained in an examination of Egyptian soils are reported.

[a] Jour. Amer. Chem. Soc., 26 (1904), p. 294.

Sodium peroxid in organic analysis, F. VON KONEK and A. ZÖHLS (*Ztschr. Angew. Chem., 17 (1904), No. 50, p. 1887*).—Referring to a previous note by Pringsheim (E. S. R., 16, p. 536) the authors call attention to the fact that in case of meals it is necessary to use from 15 to 18 gm. of sodium peroxid for 0.5 gm. of the substance in order to obtain perfect oxidation and fixation of the nitrogen, and that there is great danger of loss of nitrogen in conducting the oxidation in a cylinder covered with a loose cap.

In experiments in which cinchonin, styphnin, and picrin acids were oxidized by burning with about 150 times their weight of sodium peroxid, only from 80 to 90 per cent of the theoretical amount of nitrogen was obtained in form of nitrate.

The estimation of sulphur by means of sodium peroxid, A. NEUMANN and J. MEINERTZ (*Ztschr. Physiol. Chem., 43 (1904), No. 1-2, pp. 37-40*).—Tests of the value of sodium peroxid in the estimation of sulphur are briefly reported.

On the preparation of pure sodium hydroxid for laboratory purposes, F. W. KÜSTER (*Ztschr. Anorgan. Chem., 41 (1904), No. 3, pp. 474-476*).—A simple method, with apparatus required, for preparing sodium hydroxid by suspending stick sodium over water in a bell jar and allowing the hydroxid to be formed by absorption of the aqueous vapor, is described.

The present problems of physiological chemistry, R. H. CHITTENDEN (*Pop. Sci. Mo., 66 (1904), No. 2, pp. 150-165*).—In an address before the section of physiological chemistry of the International Congress of Arts and Science, at St. Louis, September 22, 1904, attention was directed to many problems of physiological chemistry which demand attention.

The investigations which the author cites show that the results already obtained warrant the hope that future work will be attended with success. Some of the questions suggested are studies of the structure of proteids, the production of specific bodies by various groups of cells, the actions of ferments and enzyms, the demands of the body for protein and energy, the comparative value of similar constituents supplied by different foods, the relation between stereochemical configuration and physiological action, immunity, the action of antitoxins, and related subjects.

The article is a summary of work which has been accomplished along these lines, and is suggestive of the opportunities which await the physiological chemist.

Studies of the fat and acids of flour, BALLAND (*Jour. Pharm. et Chim., 6. ser., 19 (1904), pp. 64-71; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 4, pp. 252, 253*).—The studies reported were made with fresh and stored flour. In fresh flour the fat, according to the author, consists principally of a fluid oil with small quantities of solid fatty acids. On storing the proportion of oil diminishes and the fatty acids increase, the ratio of the two furnishing a means of judging of the age of the flour.

The acid reaction of flour is due to a number of organic acids derived from the fat, and the amount increases with the age of the flour. The more fat any given flour contains the more it is subject to change. Flours from hard wheats change more quickly than those from soft wheats. The gluten of wheat does not undergo change on storage until after the fatty acids have disappeared.

The estimation of fat in milk and cream (*Dept. Agr. and Tech. Instr. Ireland, Bul. 4, misc. ser., 1903, pp. 14*).—Detailed directions for sampling and testing milk and cream in practical dairy work.

Investigations of Sichler's sin-acid butyrometry, P. GORDAN (*Milch Ztg., 33 (1904), No. 48, pp. 755, 756*).—While the author was able to obtain results by this method (E. S. R., 16, p. 506) under certain conditions which agreed closely with those obtained by well-known methods of determining fat in milk, he considers the Gerber method better for general use, especially as the composition of the reagents used with the sin-acid butyrometer is kept secret.

In a subsequent number of the above journal (No. 50, p. 790) a reply to this article is made by the proprietors of the sin-acid butyrometer, and in a still later number (No. 52, p. 822) Gordan comments further on the use of the new method, stating that in his opinion it can not compete with the Gerber method.

Experiments on the usefulness of sin-acid butyrometry, DU ROI and KOEHLER (*Milch Ztg., 33 (1904), No. 50, pp. 787–790*).—Tests of Sichler's sin-acid butyrometer with milk, cream, skim milk, and buttermilk in comparison with the Gerber method are reported. From the data secured the authors are convinced that, when carefully carried out, good results may be obtained by the new method. For many purposes it is believed to be equal to other methods although where many tests are to be made its usefulness is not so certain, as more time is required to make the test.

Results of tests of Sichler's sin-acid butyrometry, M. KLASSERT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 1, pp. 12–15*).—Tests of this method in comparison with the Gerber method are reported, from the results of which the author concludes that the new method in its present condition is not satisfactory, either with or without the use of the centrifuge.

Sin-acid butyrometry, M. POPP (*Molk. Ztg., 18 (1904), No. 53, pp. 1267–1269*).—Comparative tests of the sin-acid method and the Gerber method showed variations as great as 0.6 per cent. In 12 determinations by the new method on the same milk a variation of 0.4 per cent was observed. It is considered clear that the sin-acid method can not compete with the Gerber method, much less replace it.

The determination of fat in milk treated mechanically, M. SIEGFELD (*Molk. Ztg., 18 (1904), Nos. 39, pp. 931–933; 40, pp. 957–959; 44, p. 1058*).—The author made a study of the comparative value of the Adams, Gerber, and Gottlieb methods of determining fat in milk which had been agitated at a temperature of about 50° C. The results obtained by the Gerber method in the milk before and after agitation agreed perfectly, while the Gottlieb method in several cases gave somewhat too low results, and the results obtained by the Adams method were, on the average, 0.12 to 0.25 per cent too low.

Comparisons of results obtained by the use of these methods with "homogenized" milk, according to Gaulin's method, and with skim milk from agitated milk were also made, and the results are given in the paper.—F. W. WOLL.

Practical experience with the Gerber method of cream and butter analysis, J. SIEDEL and A. HESSE (*Molk. Ztg., 18 (1904), Nos. 22, pp. 505, 506; 23, pp. 529–532*).—The results of the experiences of the authors are given in this paper, leading to the conclusion that the Gerber method of determination of fat in cream or butter can never be depended upon to give satisfactory results, because of the large source of unavoidable errors in the examination of these products.—F. W. WOLL.

On the applicability of the "Lactoscope," F. LAUTERWALD (*Molk. Ztg., 18 (1904), No. 26, pp. 607–609*).—The article contains a description of the apparatus, with illustrations, and comparative results of tests with this and with the Babcock or Gerber tests.

On account of the large capacity of the apparatus and its great ease of manipulation, the author considers it applicable to creamery conditions. While the results of single determinations are not as accurate as in the case of the other milk tests mentioned, the larger number of tests that can be made without difficulty makes it possible to test more frequently than where the other tests are used, and it is held that the monthly averages will, therefore, be as reliable as in the case of these tests.—F. W. WOLL.

On some methods of determining fat in skim milk, L. VANZETTI (*Ann. Soc. Chim., 11 (1904), No. 5–6; abs. in Rev. Gén. Lait, 3 (1904), No. 20, p. 475*).—The determination of fat in skim milk by drying with sand or kaolin and extracting with

ether was found unsatisfactory by the author. The usual time of extraction was insufficient to remove all the fat. The Gerber test is considered preferable to all others if made properly.

The improved Gerber method of determining fat in cheese, P. Wieske (*Molk. Ztg., 18 (1904), No. 24, p. 556*).—The article describes Siegfeld's modification of the Gerber method for the determination of fat in cheese, consisting in dissolving the cheese in hot acid (80° C.) and adding amyl alcohol after the solution has cooled to about 60° C. The author states that the modified method gives equally satisfactory results in the case of full-cream cheese, Swiss, Tilsit, and hard skim-milk cheese.—F. W. WOLL.

The identification of cocoanut oil in butter fat, F. Wiedmann (*Molk. Ztg., 18 (1904), No. 29, pp. 681–683*).—The author recommends the following methods for determination of adulterations of butter fat with cocoanut oil and other foreign fats: Reichert-Meissl number, Polenske test (E. S. R., 15, p. 850), and the melting point of the insoluble fatty acids.—F. W. WOLL.

The identification of cocoanut fat in butter, A. Segin (*Arch. Pharm., 242 (1904), No. 6, pp. 441–450*).—Studies of methods of estimating cocoanut fat.

Studies on the browning and foaming of natural butter and margarine when heated, P. Pollatschek (*Chem. Rev. Fett- u. Harz-Ind., 11 (1904), pp. 27, 28; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 4, p. 248*).—In connection with studies of renovated butter the author was led to study the reasons for the foaming which is observed when butter and oleomargarine are heated, and came to the conclusion that it is due to the presence of minute quantities of soaps. The browning of natural butter, he concluded, could not be attributed alone to its lecithin content.

Browned butter contains a fine precipitate which is of a brown color, and the fat itself is also a dark brown. In the case of oleomargarine, the addition of egg white and also yolk with milk sugar gives a brown sediment when the fat is heated. The fat itself remains yellow or is only slightly darkened. When egg oil and lecithin are added in small quantities the fat becomes slightly brown, but a considerable amount of lecithin, 4.5 per cent, is required to cause as dark a color as is noted when natural butter is browned.

The conclusion was reached, therefore, that lecithin is not the sole cause of the browning of natural butter as in cookery.

Concerning the comparative viscosity of culinary fats and oils, M. Pleissner (*Arch. Pharm., 242 (1904), No. 1, pp. 24–31, fig. 1, dgms. 2*).—Experimental data are reported and discussed with special reference to the use of this factor as a means of detecting adulteration.

A synthesis of fat through the reversible action of a fat-splitting enzym, A. E. Taylor (*Univ. California Pubs., Path., I, 3, p. 33; abs. in Zentbl. Physiol., 18 (1904), No. 17, p. 524*).—Using lipase from castor-oil beans, the author was able to produce olein from glycerin and oleic acid. No glycerid could be formed, however, from acetic, butyric, palmitic, or stearic acid, nor could a triglycerid be formed using mannit or dulcit instead of glycerin.

The heat of combustion of a number of organic compounds, E. Fischer and F. Wrede (*Sitzber. K. Preuss. Akad. Wiss. [Berlin], Phys.-Math. Kl., 1904, Apr., p. 687; abs. in Zentbl. Physiol., 18 (1904), No. 13, pp. 374, 375*).—Using a modified form of the Berthelot bomb, the author determined the heat of combustion of a number of compounds of especial interest from the standpoint of physiological chemistry and studied the relation between heat of combustion and chemical structure. The conclusion is especially interesting that the formation of a polypeptid from the corresponding amido acid (calculated as a solid) is accompanied by the absorption of about 4.5 calories for each anhydrid condensation.

Pure glycogen, Mme. Z. Gatin-Gružewska (*Arch. Physiol. [Pflüger], 102 (1904), No. 10-12, pp. 569-591, pls. 2, fig. 1*).—The preparation of pure glycogen, its appearance, and related questions are discussed on the basis of an extended investigation. Earlier work has been reported (E. S. R., 15, p. 759).

Judging egg noodles, H. Lührig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 3, pp. 141-151*).—A critical study of the estimation and value of the lecithin-phosphorus content of egg noodles as a means of judging their value.

The detection of artificial coloring matter in egg noodles, K. Dannenberg (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 535-538*).—Analytical methods are discussed.

Concerning lupine alkaloids, E. Schmidt (*Arch. Pharm., 242 (1904), No. 6, pp. 409-415*).—Lupine alkaloids are discussed and the results of chemical studies by G. F. Bergh reported.

Concerning the alkaloids of perennial lupines, G. F. Bergh (*Arch. Pharm., 242 (1904), No. 6, pp. 416-440, fig. 1*).—A chemical study dealing with the preparation and properties of the alkaloids of perennial lupines.

The occurrence of quinol in the pear tree, G. Rivière and G. Bailhache (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 1, pp. 81-83*).—According to the authors, quinol may be extracted by ether from pear-tree buds, the amount present equaling 3 to 5 gm. per kilogram. The maximum yield occurs with the most active stage of vegetation. Quinol is not found in the mature plant, being oxidized to quinone by the laccase contained in the plant. Apple-tree buds, the authors state, contain phloridzin but no quinol.

Micro-photography in the microscopic examination of foods and feeding stuffs, Neubauer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, pp. 683, 684*).—In an address before the seventy-sixth meeting of the German Naturalists and Physicians, at Breslau, September, 1904, attention was called to the importance of micro-photography in studies of foods and feeding stuffs.

Bleaching woody and cork tissue in the examination of powdered spice, H. Haupt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 10, pp. 607-610*).—The method described consists in treating the material to be examined with chlorin formed from potassium chlorate and hydrochloric acid.

Report of chemical division, B. C. Aston (*New Zealand Dept. Agr. Rpt. 1904, pp. 129-151*).—A number of analyses are reported of milk, butter, cattle feeds, apples, rocks, soils, fertilizers, etc. In connection with the study of bush disease some analyses, including ash constituents, were made of meat, blood, and bone. Notes are also given regarding the testing of apparatus and other work of the department.

Present methods of tannin analysis and their influence on the manufacture of leather, J. R. Mardick (*Jour. Soc. Chem. Ind., 23 (1904), No. 24, pp. 1187-1189, fig. 1*).—This article briefly discusses the character and reliability of present methods of tannin analysis, and suggests a number of improvements in the methods.

Arsenic in papers and fabrics, J. K. Haywood and H. J. Warner (*U. S. Dept. Agr., Bureau of Chemistry Bul. 86, pp. 53*).—This bulletin discusses the causes of poisoning by arsenical papers, cites cases of such poisoning by wall papers and fabrics, gives compilations of the previously reported determinations of the arsenic content of such materials and of the laws of the United States and of foreign countries bearing on the question, and describes the method of determining arsenic used in the Bureau of Chemistry.

The results are reported of examination of 537 samples of wall papers, 72 samples of dress goods, 41 samples of stockings, 23 samples of miscellaneous fabrics, such as upholstery, draperies, etc., 21 samples of carpets, and 45 samples of fur goods and rugs. In determining arsenic a modification of Sanger's method was used.

"Stated briefly, the following conclusions regarding the arsenic content of papers and fabrics sold on the American market may be drawn from the data collected:

"(1) If 0.1 grain per square yard is considered as the maximum amount of arsenic allowable in wall papers, the condition of the market is quite satisfactory, but if for reasons previously mentioned the limit is reduced to 0.05 grain per square yard some improvement should be made.

"(2) The arsenic content of glazed, shelf, and crêpe papers is as small as could be reasonably expected.

"(3) Entirely too large a percentage of the dress goods, dress furs, and fur rugs sold on the American market contain excessive amounts of arsenic.

"(4) The presence of excessive amounts of arsenic in such goods as are described in paragraph 3 is dangerous to the health of a large number of people, especially those who are susceptible to arsenic poisoning.

"(5) The arsenic content of miscellaneous fabrics other than dress goods—such as pillow covers, hangings, carpets, etc.—is in the main satisfactory with the present limit for arsenic; but if this limit were reduced to 0.05 grains per square yard, as advocated for wall papers, a considerable number of carpets would be without the pale."

The abstracting of current chemical literature, H. Marshall (*Chem. News, 90 (1904), No. 2350, pp. 283, 284*).—The author calls attention to the multiplication of abstracts, and outlines a plan requiring international cooperation by which this will be avoided. It is suggested that all abstracts be prepared under the direction of an international commission and also translated into the different languages under the same supervision. The publication of the various editions would devolve upon the separate organizations. It is considered that the initiation of the international scheme for physico-chemical papers shows that the difficulties in the way of the scheme proposed are not insuperable.

BOTANY.

Plant morphology, O. W. Caldwell (*New York: Henry Holt & Co., 1904, pp. VI+190*).—This is a revised and rewritten edition of the Handbook of Plant Dissection, by J. C. Arthur, C. R. Barnes, and J. M. Coulter, issued in 1886. Since that time the methods of laboratory work and plant morphology in general have made such advances as to require a rewriting of the book.

The influence of dry and moist air on the form and structure of plants, P. Eberhard (*Ann. Sci. Nat., Bot., 18 (1903), pp. 61–152, pl. 1, figs. 17; rev. in Gard. Chron., 3. ser., 36 (1904), No. 915, p. 17*).—The author has investigated the effect of excessive drought and a saturated soil and atmosphere on the form and structure of a large number of species of plants. As a result of his investigations he concludes that excessive drought results in a dwarfing of the stems, associated with an increased rigidity, and diminished length, but an increase in the number of internodes. There is also a reduction in the size of the leaves, an increase in their thickness and intensity of color, an increase in hairiness, and an earlier leaf fall.

The effect produced by extreme drought on the internal anatomy of the plants was shown in a smaller size of the epidermal cells; a reduction of the cortex and pith; an increase of secretory canals and their secretions, as well as of raphids; an increase of sclerenchyma, collenchyma, and wood; a hastening of development of the bark; and an increase in the thickness of cell walls and in the activity of the generative cells. Under a moist atmosphere precisely the converse took place.

The adaptation of plants to the intensity of light, J. Wiesner (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 22, pp. 1346, 1347*).—The author has for a number of years been conducting experiments on the effect of intensity of light on plants, pursuing his studies in different parts of the world from 6° to 79° north latitude and

at many different altitudes. He has measured the amount of light falling upon a plant and the total illumination during the day, and the proportion between these two factors he proposes calling "photolepsis." This factor when presented as a fraction can never be greater than 1, and it is found to vary with different plants at different altitudes and latitudes.

The minimum of photolepsis at Vienna was determined for *Pinus laricio* as $\frac{1}{11}$, for *Acer platanoides* $\frac{1}{55}$, and for *Buxus sempervirens* $\frac{1}{100}$. The minimum is always the lowest for deciduous trees and it varies materially with the period of leaf growth, temperature, latitude, etc. At the beginning of leafing the maximum photolepsis for *Acer platanoides* is 1. At Vienna in early spring it was found to be $\frac{1}{9}$, and it fell to $\frac{1}{55}$ later in the season when in full leaf. At Trondhjem, Norway, it had a stationary value of $\frac{1}{28}$, while at Tromsoe, Norway, it was $\frac{1}{5}$. This proportion is approximately constant.

The author concludes that the adaptation of a given plant to intensity of light can not be expressed by a definite optimum, but it is modified by climate, temperature, surrounding medium, etc. Further, the adaptation is influenced by the diffused light in which most plants grow. He holds that plants are continually subjected to changes in light intensity and believes that few plants receive a definite optimum of light.

Perception of the force of gravity by plants, F. Darwin (*Nature [London], 70 (1904), No. 1819, pp. 466–473, figs. 3*).—In an address before the Section of Botany of the British Association for the Advancement of Science, the author summarized the various hypotheses relative to the perception of the force of gravity by plants.

Considerable attention was paid to the statolithic theory, which is based on the difference in specific gravity of the nucleus, chloroplasts, crystals, starch bodies, etc., occurring in the cell sap. These will exert pressure on the physically lower or higher cell walls according as they are heavier or lighter than the cell sap. As long as the stem is vertical and the apex upwards the heavier bodies rest on the basal wall and the plant is not stimulated to curvature. If the plant should be placed horizontally so that the heavy bodies rest on the lateral cell walls, the plant is stimulated to curve.

This hypothesis was discussed at length and experimental evidence cited to substantiate it. The author attributes the fundamental principles of this hypothesis to Haberlandt and Nemec, and in conclusion states that "this may fairly hold the field until a better theory of graviperception and a better theory of the falling of starch grains are established."

The distribution of the more important materials in kohl-rabi and carrots, Zielstorff and Beger (*Fühling's Landw. Ztg., 53 (1904), No. 13, pp. 491–495*).—Studies are reported on the distribution of the dry matter and nitrogen-free extract in kohl-rabi and carrots. The plants were divided into tops, crowns, and roots, which were subdivided into cortex and inner parts, and the percentage of dry matter and nitrogen-free extract determined. Considerable variation was noted in the content of the different parts of the plants, and this is believed to be an important consideration in experiments in plant breeding.

The influence of assimilable nitrogen on the action of root tubercle bacteria, F. Nobbe and L. Richter (*Landw. Vers. Stat., 59 (1903), No. 3–4, pp. 167–174*).—Investigations have been carried on upon the influence in the soil of assimilable nitrogen on the action of root tubercle bacteria.

The authors give the results of 3 series of pot experiments which were conducted with hairy vetches, and aside from the nitrogen present in the soil or added to the pots the treatment in all cases was the same. Where a large amount of assimilable nitrogen was added, there was a relatively lessened nitrogen assimilation for the inoculated pots and an increased assimilation for the uninoculated ones, although

the absolute gain in dry matter and nitrogen content of the plants was in every case greatest where inoculation had taken place. In the experiments made with garden soils the most important gains were invariably in those pots which had received pure cultures of the nitrogen assimilating organisms.

The influence of nutrition on the development of root tubercles on leguminous plants, H. FLAMAND (*Ingén. Agr. Gembloux, 14 (1904), No. 15, pp. 755–765*).—The author reports upon a series of experiments in which the effect of various substances on the development of tubercles on leguminous plants was noted. Seedlings of peas, vetches, and beans were grown in water cultures, and at the end of the third week the roots of the young plants were inoculated with a needle with portions of fresh tubercles from beans or vetches. All the experiments were conducted in duplicate, and the effect of various forms of nitrogen, potash, lime, and magnesium on the development of the tubercles was noted.

The formation of the tubercles seemed to be dependent on the nature and amount of the salts present in the nutritive solution. No tubercles were produced where potassium nitrate was present to a greater extent than 1 to 10,000 parts. The other inorganic forms of nitrogen influenced the presence of root tubercles to a considerable degree, and some of the organic forms, such as urea, oxamid, or potassium cyanid, were very prejudicial to the production of root tubercles, even when used in very dilute solutions.

In the case of the vetches no tubercles were produced in the absence of magnesium, and where neither lime nor magnesium was present there were no root tubercles on either vetches or beans. The potash salts seemed to favor to some extent the development of root tubercles, as did also lime salts.

On the subsequent effect of soil inoculation of leguminous plants on other cultivated plants, F. NOBBE and L. RICHTER (*Landw. Vers. Stat., 59 (1903), No. 3–4, pp. 175–177*).—The effect of inoculation of leguminous plants on subsequent crops is shown by results obtained with oats grown after vetches, comparisons being drawn between inoculated and uninoculated pots. The yield, dry weight, and nitrogen content of oats were highest in every case where the previous crop had been an inoculated one.

Symbiosis in the genus Lolium, E. M. FREEMAN (*Minnesota Bot. Studies, 3. ser., 1904, pt. 3, pp. 329–334*).—In a previous article (E. S. R., 14, p. 842) the author gave a preliminary account of the symbiosis occurring in species of Lolium, in which the intimate relationship between the fungus and the host plant was shown. The existence of the fungus in *Lolium temulentum*, *L. perenne*, and *L. italicum* has been demonstrated, but its life history has been determined only in the case of the first species. It is believed that there is no material difference between the life-cycle of the other species and that already known of the first mentioned.

In ordinary commercial mixtures of seed of *L. temulentum* from 85 to 98 per cent show the presence of the fungus hyphæ in the hyaline layer, just exterior to the aleurone cells. On germination the hyphæ keep pace in their growth with the growing plant, and finally reach the young ovaries, developing luxuriantly. Since the establishment of these facts the author has attempted in various ways, by altering the conditions of growth of the fungus, to induce it to form spores, but all efforts have as yet failed. These failures are believed to be due to the habit of mycelial infection having been so well established that the ability to form spores has been lost, or the fungus may be some ergot-forming parasite, or one which forms spores in some other organ of the host plant.

Cultural investigations have been carried on which confirmed the results of previous anatomical research on the life history of the fungus. Plants affected and without the fungus were placed under similar conditions. The entire crop of seed was gathered, and from each lot 100 were examined, and in every case 100 per cent

was true to the parent form, whether infected or noninfected. Seeds from this crop were planted, and both races seemed to thrive, the infested plants being on the average slightly more vigorous. All observers who have investigated this subject agree that the fungus exercises no noticeably injurious effect upon the host. The nature of the fungus still remains unsolved. The author believes, however, that its closest affinities are with the Ustilagineæ. All attempts to infect plants from noninfected seeds or to grow noninfected plants from infected seeds have failed, seeming to indicate that there are two well-defined races of the different species which have been under observation, one with and the other without the fungus symbiont.

Mycorrhiza and its rôle in the nutrition of forest trees, P. Jaccard (*Jour. Forest. Suisse, 1904, No. 2–3, pp. 30, figs. 10; abs. in Bot. Centbl., 96 (1904), No. 27, p. 10*).—A critical review is given of the subject of Mycorrhiza and its influence on nitrogen nutrition of forest trees. A bibliography is given of the principal works relating to this subject.

Electricity in agriculture, E. Guarini (*L'Electricité agricole. Paris: Librairie Fischbacher, 1904, pp. VIII+162, figs. 60*).—This book gives a résumé of recent investigations on the effect of electricity on seeds and the use of electricity in electroculture, describing the direct and indirect influence on plant growth and the various methods for utilizing atmospheric, static, and dynamic electricity. In addition, chapters are given on the effect of electric light and on the use of electricity for the destruction of insects. The use of electric power for agricultural machines and in various industries is described, as well as the use of electricity in wine and alcohol making, the purification of sugar, etc.

Electricity in agriculture and horticulture, S. Lemström (*London: "The Electrician" Printing and Pub. Co., Ltd.; New York: The D. Van Nostrand Co., 1904, pp. IV+72, figs. 10*).—This book gives the results of a long study and numerous experiments by the author, which had their beginning in investigations in the Polar regions and were continued in more southern latitudes. They have led not only to an increase of the harvest of every kind of plant which has come under treatment, but also to a favorable change of their chemical compounds, such as an increase of the digestible nitrogenous matter in seeds, of the sugar in sugar beets, and of the sweetness in berries. Many of the investigations here reported have been noted elsewhere (E. S. R., 14, pp. 352, 656).

Electricity in agriculture (*Rhodesian Agr. Jour., 2 (1904), No. 1, pp. 31, 32*).—This is a review of a treatise in which Prof. S. Lemström, of Helsingfors, summarizes the results of investigations on the influence of electrical currents on the growth of various crops, as follows:

"(1) The real increase per cent due to electrical treatment has not yet been exactly determined for the different vegetables which have been under experiment. But we are approaching its smallest value in fixing it at 45 per cent for land of average fertility. (2) The better and more scientifically a field is cultivated and manured, the greater is the increase per cent. On poor soil it is so small as to be scarcely perceptible. (3) Some vegetables cannot endure the electrical treatment if they are not watered, but then they will give very high percentage increases. Among these are peas, carrots, and cabbage. (4) Electrical treatment when accompanied by hot sunshine is damaging to most vegetables, probably to all; wherefore, if favorable results are aimed at, the treatment must be interrupted in the middle of hot and sunny days."

The present status of the question of electroculture, K. K. Khodorovski (*Khozyain, 1903, Nos. 1–4; rev. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 3, p. 403*).

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev.*, *32* (*1904*), *Nos. 7, pp. 303–352, figs. 3, charts 10; 8, pp. 353–400, figs. 7, charts 13; 9, pp. 401–444, pls. 2, fig. 1, charts 10; 10, pp. 445–496, figs. 13, charts 11; 11, pp. 497–546, figs. 7, charts 11*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of July, August, September, October, and November, 1904, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 7.—Special contributions on The Movements of the High Clouds in the West Indies, by J. T. Quinn; The Dissemination of Daily Forecasts by Telephone, by W. G. Burns; Attempts at Methodical Forecasting of the Weather, by L. Besson; Air Radiation (illus.), by C. C. Hutchins and J. C. Pearson; and notes on observations at Tasiusak; climatology of Baltimore, Md.; meteorology at Montpellier, France; tornado in Mobile County, Ala.; hailstorm at Pueblo, Colo.; early American weather records; weather and crops in Arizona; the weather of Iceland and Europe; a home-made globe; does the aurora ever envelop the whole earth? fake forecasts; lightning strokes in the open field; the climate of Manila; an Italian hailstorm in 1545; secular changes in climate; a tertiary rainbow; meteorology in Chile; earthquakes in California; the duration and rate of rainfall; the capacity of the air for aqueous vapor; ocean meteorology; temperature of the upper atmosphere; precipitation in Wisconsin; cannonading against hail; and passage of sound through the atmosphere.

No. 8.—Special contributions on Local Storm at St. Louis, Mo., August 19, 1904, by L. H. Daingerfield; Cloudburst near Citrus, Cal., by W. E. Bonnett; The Annual and Geographical Distribution of Cyclones of High Velocity (Over 500 Miles in Twelve Hours) in the United States, 1893–1902 (illus.), by S. Hanzlik; The Unusual Rainfall of February at Honolulu (illus.), by R. C. Lydecker; Dust in the Atmosphere during 1902–3, by A. Noble; Storm of August 20, 1904, in Minnesota, by T. S. Outram; The Origin of the Cuba Cyclones of June 13–14, 1904 (illus.), by M. Hall; Recent Contributions to Climatology, by C. F. Talman; Earthquake of August 27, 1904 (illus.), by C. F. Marvin; and notes on Dr. George W. Hay; the primary and secondary rainbows (illus.); formation and movement of hurricanes; a legal decision as to damage by lightning and wind; Weather Bureau men as instructors; the Helwan and Abbassia observatories; the heuristic method; the Galveston hurricane and ocean wave; are the movements of thunderstorms deflected by the tide? and the diurnal variation of the barometer at Milwaukee.

No. 9.—Special contributions on A New Theory of Fog Formation, trans. by F. W. Proctor; Three Notable Meteorological Exhibits at the World's Fair (illus.), by J. H. Spencer; The Dignity of the Service, by J. H. Scarr; Vortex Rings as Revolving Solids, by F. J. B. Cordeiro; and notes on meteorology in Roumania; the bulletins of the Japanese service; Weather Bureau men as instructors; rainfall in Fiji; Professor Ward on the climate of the United States; the third convention of Weather Bureau officials; observations for twelve months in Lassa; observations at the Franco-Scandinavian station for aerial soundings; wind velocity and ocean waves; record of droughts at Raleigh, N. C.; and a pack trail on Mount Whitney (illus.).

No. 10.—Special contributions on Studies of Raindrops and Raindrop Phenomena (illus.), by W. A. Bentley; The Advancement of Meteorology, by T. H. Davis; Thunderstorms at Tampa, Fla. (illus.), by J. Bily, jr.; An Index of Meteorological Items in the Jesuit Relations, by F. L. Odenbach; Mount Tsukuba Meteorological Observatory—What Does Meteorology Need for Its Future Advancement? by S. T. Tamura; and September Floods in the Southwest, by F. H. Brandenburg, W. H. Alexander, and J. B. Sloan; and notes on Royal Meteorological Society, Journal of the Meteorological Society of Japan, Weather Bureau men as instructors, award of

the Buys ballot medal, long-range forecasts (by H. B. Wren), effect of rainfall on the palm-oil tree, seasonal rainfall régimes in the United States (illus.), tropical storm of October 10 to 20, 1900, and the Dechevrens anemometer—cold waves.

No. 11.—Special contributions on Airy's Theory of the Rainbow (illus.), by D. Hammer; Radiation in the Solar System, by J. H. Poynting; A Simple, Effective, and Inexpensive Lightning Recorder (illus.), by H. F. Alciatore; and The Introduction of Meteorology into the Courses of Instruction in Mathematics and Physics, by C. Abbe; and notes on work of the Weather Bureau, an honest long-range forecaster, meteorological course at Williams College, Weather Bureau station at Charles City, Iowa (by C. J. Root), meteorology in New South Wales, Australia, Hawaiian climate and crop service, antarctic meteorology, deflection of thunderstorms with the tides, Weather Bureau records, Weather Bureau men as instructors, Assmann's sounding balloons at the St. Louis Exposition, trails of meteors, darkness at Memphis, flood on the South Canadian River in Oklahoma and Indian Territory, October 1-4, 1904, and a proposed international contest of weather forecasters.

Meteorological observations, J. E. OSTRANDER and G. W. PATCH (*Massachusetts Sta. Met. Buls. 190, 191, 192, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during October, November, and December, 1904. The general character of the weather of each month is briefly discussed and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure[a] (inches).—Maximum, 30.96, March 5; minimum, 28.73, November 13; mean, 30.034. *Air temperature*[b] (degrees F.).—Maximum, 94.5, July 19; minimum, —26, January 5; mean, 43.9; mean sensible (wet bulb), 39.5; maximum daily range, 49, October 17; minimum daily range, 3.5, March 22; mean daily range, 21.8. *Humidity.*—Mean dewpoint, 35.5; mean relative humidity, 77. *Precipitation.*—Total rainfall or melted snow, 45.3 in.; number of days on which 0.01 in. or more rain or melted snow fell, 126; total snowfall, 59.5 in. *Weather.*—Total cloudiness recorded by sun thermometer, 2,053 hours, or 46 per cent; number of clear days, 142; number of fair days, 96; number of cloudy days, 128. *Bright sunshine.*—Number of hours recorded, 2,401, or 54 per cent. *Wind.*—Prevailing direction, west; total movement, 46,994 miles; maximum daily movement, 450 miles, November 14; minimum daily movement, 0 mile, January 6; mean daily movement, 128 miles; maximum pressure per square foot, 23.5 lbs., February 8, WNW.; October 21, SSE. *Dates of frost.*—Last, April 23; first, September 22. *Dates of snow.*—Last, April 20; first, October 12.

Meteorological records for 1903 (*New York State Sta. Rpt. 1903, pp. 456-462*).—Tables are given which show the average monthly precipitation since 1882; average monthly temperature since 1883; tridaily readings of the standard air thermometer during each month of 1903; a monthly summary of maximum, minimum, and standard thermometer readings; and daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year.

Report of the meteorological council (*Rpt. Meteor. Council [Great Britain], 1904, pp. 203, fig. 1, chart 1, map 1*).—An account of the work of the council during the year ended March 31, 1904, in the lines of marine meteorology, forecasts and storm warnings, climatology, and miscellaneous investigations is given, with statements regarding publications of the council and its library and finances.

The organization, meetings, proposed cooperation, correspondence, and information of a miscellaneous character are given in a series of appendixes. The success of 8.30 p. m. forecasts (wind and weather) during 1903-4 was, complete 56 per cent, partial 30 per cent. The averages for the preceding 10 years were, complete 55.4 per cent, partial 27.8 per cent. A long list is given of accessions to the library during the year, arranged on the lines of the international catalogue of scientific literature.

[a] Reduced to freezing and sea level. [b] In ground shelter.

The meteorology of the [British] empire during the unique period 1892-1902, J. Eliot (*Broad Views, 1 (1904), pp. 191-201*).

Meteorological review, Nancy, 1854-1903 (*Bul. Soc. Sci. Nancy, 3. ser., 5 (1904), No. 2, pp. 98-105, dgms. 5*).—The course of the temperature and rainfall during this period is traced in diagrams and briefly discussed.

Rainfall in the agricultural districts, E. L. Fowles (*Queensland Agr. Jour., 15 (1904), No. 5, p. 745*).—A table is given showing total rainfall for each month from October, 1903, to October, 1904, inclusive, in the agricultural districts of Queensland.

The heat exchange in soil, water, and atmosphere, J. Schubert (*Ber. Deut. Phys. Gesell., 2 (1904), No. 9, pp. 173-175*).—The difference between the highest and lowest heat content during the year is taken as the heat exchange. This is shown to be much larger in the case of the sea than in case of land and atmosphere.

Plants and frost, E. Vanderlinden (*Ciel et Terre, 25 (1904), pp. 121-128*).

The relation of yield to weather factors, P. Holdefleiss (*Wetter, 21 (1904), No. 9, pp. 205-211*).

Wind and weather, L. Weber (*Wind und Wetter. Leipzig: B. G. Teubner, 1904, pp. V+130*).

Investigations on the influence of the diurnal rotation of the earth on atmospheric disturbances, M. Gorodensky (*Ann. Soc. Météor. France, 52 (1904), pp. 113-120*).

On the diurnal variations of air pressure in Berlin, R. Börnstein (*Ber. Deut. Phys. Gesell., 2 (1904), No. 12, pp. 193, 194*).

On the general circulation of the atmosphere in middle and higher latitudes, W. N. Shaw (*Proc. Roy. Soc. [London], 74 (1904), No. 497, pp. 20-30*).

The atmosphere as an electropneumatic motor, K. Keller (*Die Atmosphäre ein Elektropneumatischer Motor. Zurich: Keller, 1903, pp. 103; abs. in Naturw. Rundschau, 19 (1904), No. 36, p. 465*).

Electrical methods of measuring temperature (*Sci. Amer. Sup., 57 (1904), No. 1483, pp. 23768, 23769*).

Present problems of meteorology, A. L. Rotch (*Science, n. ser., 20 (1904), No. 521, pp. 872-878*).—The problems of dynamic meteorology are considered most pressing and require for their solution a more systematic study of the upper air. Progress in this line of study is reviewed and some of the newer methods employed are described. The application of these methods in the study of atmospheric circulation, vertical, thermal and hygrometric gradients, the relations of solar energy to atmospheric electricity and terrestrial magnetism, and similar problems are discussed.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit., 2 (1904), Sept., pp. VIII+296*).—The second annual issue, including references to literature of meteorology and terrestrial magnetism appearing in 1901, which were omitted from the first volume (E. S. R., 14, p. 847), as well as to literature appearing during 1902.

WATER—SOILS.

The underground waters of southern California, W. C. Mendenhall (*Forestry and Irrig., 10 (1904), No. 10, pp. 448-455, fig. 1*).—This article discusses general conditions, but explains especially the conditions in the artesian basins of the Coastal Plain, Chino, San Bernardino, and San Jacinto, which originally had areas of 295, 24, 30, and 14 square miles, respectively, but which under the combination in recent years of heavy withdrawals of ground water and a shortage of rain have been reduced 33 per cent or to a total area of 250 square miles.

In a few cases the plane of saturation has been lowered from 60 to 70 ft. during the period from 1900 to 1904, in which the deficiency of rainfall was, roughly, 20

per cent. The author does not consider this shrinkage a sufficient cause for serious alarm if "it is recognized that the proper function of these stored supplies is to tide the communities through the dry periods. They will be most heavily drawn upon when the rainfall is lightest."

Recent experiments with saline irrigation, C. F. Eckart (*Hawaiian Sugar Planters' Sta. Bul. 11, pp. 14*).—This is an account of a continuation on field plats 1,500 sq. ft. in area of experiments previously conducted in small lysimeters (E. S. R., 14, p. 554). In these experiments a study was made of the effect on the yield and quality of sugar cane irrigated at intervals with fresh water and with water containing 200 gr. of salt (NaCl) per gallon (at rates of 2,199,474 and 2,864,747 gal. per acre) in connection with applications of commercial fertilizers and lime in form of ground coral and gypsum.

The soil irrigated with fresh water yielded approximately 11 tons more of sugar per acre than that irrigated with saline water. "The juice of the cane receiving saline irrigation was characterized by lower density, less sucrose and glucose, a lower purity, and a much larger content of salt than the juice of the cane receiving fresh water. Where lime in the form of ground coral and gypsum was applied a better showing was made in regard to density, sucrose, glucose, purity, and salt content than where no lime was added. The percentage of gain in the former instance was a trifle higher than in the latter. The gain in the sugar of the cane where ground coral was applied was 46.6 per cent, and with gypsum 46.9 per cent, compared with the plat that was not limed. . . .

"Occasional heavy irrigations given to a moderately porous soil receiving brackish irrigation is most effective in reducing the salt content of the soil to a less toxic quantity. A gain of 88.1 per cent of sugar was obtained in the experiment station field by a 5-in. irrigation every eighth watering. At least 77 per cent of this gain may be attributed to the leaching of salt accumulations from the soil."

Potable waters, B. C. Aston (*New Zealand Dept. Agr. Rpt. 1904, p. 147*).—Analyses with reference to potable quality of 16 samples of water from different parts of New Zealand are reported.

Soil moisture: Its importance and management, J. A. Jeffery (*Michigan Sta. Bul. 219, pp. 31–40, figs. 2*).—A general discussion of the subject, including results of tests of the water-holding capacity of clay, loam, sandy, and muck soils.

Investigations in soil fertility, M. Whitney and F. K. Cameron (*U. S. Dept. Agr., Bureau of Soils Bul. 23, p. 48, pls. 4, figs. 7*).—This bulletin reports a series of observations by different methods and with different soils and culture media, on the movement of water in soils and the absorption of water by seeds and by plants under varying conditions. Some observations on organic matter in a lawn soil are also reported.

The studies of the evaporation from soils indicate that the rate of evaporation was approximately proportional to the amount of water present, and that the loss due to evaporation was not alone a surface phenomenon, but was in large part due to evaporation within the soil itself, and can not therefore be used as a measure of capillary movement of water. A wide difference was observed in the movement of water in soil containing an optimum amount of water and in a soil short of saturation.

"If air-dry soil is packed into a tumbler, and an amount of water equal to the optimum water content be poured onto the surface, it percolates quite rapidly, and in a few hours a uniform distribution is established. If, however, considerably less than the optimum quantity be added, the water percolates into the soil for only a short distance, and uniform distribution is not established in intervals of time measured by weeks and months."

No relation was "established between the movement of water with its associated plant food and the fertility of soils." There was no evidence that infertile soils

supplied less water to seeds and plants than the more fertile soils, and there was no observable difference in the amount of moisture absorbed by seeds in soils of the same water content whether manure had previously been added to the soil or not.

"The fact that the availability of the moisture and its dissolved salts is due to something other than the texture or physical condition of the soil was shown by growing plants in an aqueous extract of the soil, when it was found that the plants showed the main characteristics of growth and development that were associated with them when grown in the soils themselves."

The following simple method of studying transpiration was used: "Seedling plants were grown in prepared solutions contained in 2-oz. bottles, each with a stopper having slits in the circumference, into which the plants were fitted, with some cork slips over them to hold them in place and to prevent direct evaporation from the inside of the bottle. The bottle was of black opaque glass, and the plants were kept in the sun throughout the day. The bottles containing the plants were weighed daily, and the loss of weight taken as the measure of transpiration. Such precautions were taken that the amount evaporated directly from the bottle was so small that it could be ignored, while the daily amount transpired by the plants was from two to ten times the weight of the plant, and the increased growth of the plant from day to day during the period of the experiment is therefore taken as negligible for purposes of the experiments."

The experiments with soil extracts, culture solutions of various kinds, as well as with soils, were made in glass tumblers or wire baskets 3 in. deep and 3 in. in diameter, coated with paraffin. The experiments were made with wheat seedlings, but no attempt was made to carry the plants to maturity—5 or 6 weeks being the extreme limit of growth in the experiments reported. The results of a large number of experiments with different culture solutions and soils of different kinds are reported in detail, but few conclusions are drawn from the data.

In the culture experiments it was found in general "that a concentration of about 170 parts per million of total dissolved salts was the most desirable, provided that at least 1 part per million of each constituent was present."

The centrifugal method of mechanical soil analysis, L. J. Briggs, F. O. Martin, and J. R. Pearce (*U. S. Dept. Agr., Bureau of Soils Bul. 24, pp. 38, pls. 2, figs. 7*).—This bulletin, which is intended to take the place of earlier publications on the subject, contains a description of the centrifugal method of mechanical soil analysis as used in the Bureau of Soils, together with the results of an investigation of the possible sources of error. The procedure followed by the Bureau in collecting and preparing the samples for analysis is stated, and a brief description is given of other methods of mechanical analysis, several of which have been extensively used in the United States. The chromic-acid method employed by the Bureau for determining organic matter is also described.

The apparatus and methods used are described in detail, from the sifting of the soil through a 2 mm. sieve and its disintegration by a mechanical shaker, through the various stages of the separation of the different grades of particles by means of the centrifugal machine and by sedimentation.

Experiments with the Brown sampling machine (described in Office of Experiment Stations Circ. 34, revised) showed that "a mechanical sampler is superior to the spatula for subsampling soils in which [the two coarsest] groups are present in any quantity. This applies also to samples in which aggregates exist larger than 0.5 mm. The mechanical sampler has the disadvantage of not giving samples of uniform weight" and "some inconvenience in calculation is thereby introduced."

While the results obtained in a study of the effect of oven-drying were not conclusive, they "indicate that drying a soil at 110° C. does not seriously modify its mechanical composition, as determined in the moist state." It was found "that

shaking for one hour [was] in some cases not sufficient to separate the clay from the larger grains. No marked change appears to take place after 6 hours' shaking, except in case of samples shaken for 77 hours, all of which show an increased amount of clay, indicating that in samples shaken for long periods a breaking down of the soil does occur to some extent. . . .

"The use of ammonia in mechanical analysis increases the percentage of [the finest] group in soils that are not alkaline by destroying the formation of floccules or aggregations of the smaller particles. In the case of strongly alkaline soils the addition of ammonia appears to flocculate the soil rather than break up the flocculations, and its use in such cases is therefore not desirable. From 5 to 10 drops of ammonia added to 5 gm. of soil in 50 cc. of water appears to be sufficient to break up the flocculations in nonalkaline soils. In case a soil contains a considerable amount of lime or magnesium carbonate flocculation will occur, which usually becomes more pronounced upon the addition of ammonia."

Eight parallel analyses of the same soil which are reported show variations of from 10.9 to 12.5 per cent in loss on ignition, 2.3 to 3.2 in group (1), fine gravel; 5.1 to 5.6 in group (2), coarse sand; 4.2 to 4.9 in group (3), medium sand; 12.6 to 14.4 in group (4), fine sand; 7.2 to 8.8 in group (5), very fine sand; 15.1 to 17.6 in group (6), silt; and 37.5 to 38.3 in group (7), clay. "These analyses may fairly be taken to represent the limit of accuracy attainable by the centrifugal method under the most favorable conditions."

Other methods of mechanical soil analysis described include Hilgard's elutriator method, Osborne's beaker method, King's aspirator method, and Yoder's centrifugal elutriator method (E. S. R., 16, p. 448).

The physical improvement of soils, J. G. Mosier (*Illinois Sta. Circ. 82, pp. 21, figs. 4*).—This is a popular summary of information relating especially to soil physics and management, and the value of organic matter. "It is preliminary to more specific and technical bulletins which are to follow, giving the detailed results of experiments and investigations relating to these subjects."

Soils of Iowa, W. H. Stevenson (*Iowa Agr., 5 (1904), No. 5, pp. 155–159*).—The following distinct classes of soils which occur in Iowa are discussed: "(1) Geest, or soils resulting from the decay of indurated rocks; (2) soils of fluviatile origin—alluvium, or stream-made soils; (3) soils of eolian origin—loess, or wind-made soils; (4) soils of glacial origin—till, bowlder clay, drift, or ice-made soils." Of these the eolian and glacial soils are by far the predominant classes.

Soils, B. C. Aston (*New Zealand Dept. Agr. Rpt. 1904, pp. 135, 136*).—Chemical analyses and the reaction of samples of soils from different parts of New Zealand are reported, the analyses being especially detailed in case of surface soils and subsoils from the Momohaki Experimental Station. The soils are shown to be especially rich in phosphoric acid and nitrogen, a considerable proportion of the phosphoric acid as well as the potash being soluble in 1 per cent citric acid.

Composition value of important types of Illinois soils based upon chemical composition, J. A. Dewey (*Illinois Agr., 8 (1903), No. 3, pp. 44–49*).—A discussion of this subject based mainly on Circular 68 of the Illinois Station (E. S. R., 15, p. 23).

On the absorptive capacity of different layers of soils, K. S. Karpizov (*Pochvoryedenie [Pédologie], 6 (1904), No. 2, pp. 137–151*).—Four soils—chernozem, clay, podzol clay, and sandy—were studied with regard to their capacity for absorbing ammonia, phosphoric acid, and lime. Of each soil three consecutive layers were examined separately, the upper, the intermediate, and the subsoil. The absorptive capacity was determined by the methods of Way and of Knop. The chemical and mechanical composition of each soil was also determined.

From the data presented the author arrives at the following conclusions: (1) The absorption of ammonia, phosphoric acid, and lime decreased from the upper layer downward in the main as the humus and the zoolites, which are the main factors

determining the absorptive capacity, decreased. (2) The degree of absorption of ammonia by the soils was in direct correspondence with their contents of hygroscopic moisture. (3) The absorption of phosphoric acid depended also upon the amount of iron oxid and alumina in the soil, and also on the amount of phosphoric acid in the soil. (4) The degree of absorption of lime depended closely upon the amount of carbonates in the soil. (5) The absorptive capacity of the soils depended, other things being equal, on their mechanical composition, the larger the proportion of soil particles smaller than 0.01 mm. in diameter the greater its absorptive capacity.—P. FIREMAN.

Influence of the structure of the soil on the yield of oats and the absorption by the latter of nitrogen and phosphoric acid, S. BOGUSHEVSKI (*Uchen. Zapiski Yuriev Univ., 1904, No. 1; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 3, pp. 375, 376*).—The author experimented during 2 years with soil particles of two different sizes, viz, those which passed through a sieve with holes 2 mm. in diameter and those between 2 and 6 mm. in diameter. The results with the two grades of particles differed but slightly.—P. FIREMAN.

Studies on the distribution of lime in the soils of Vaudois vineyards, J. DUFOUR and H. FAES (*Chron. Agr. Canton Vaud, 16 (1903), Nos. 13, pp. 381–387; 19, pp. 529–534; 20, pp. 572–579; 17 (1904), Nos. 1, pp. 15–21; 2, pp. 50–57; 14, pp. 420–429; 15, pp. 434–438*).—This is a continuation of studies previously reported (E. S. R., 14, p. 849), and records results of analyses of 482 samples of soil from the district of Aigle. Of these samples 295 contained from 0 to 25 per cent of lime (carbonate), 188 over 25 per cent. The maximum percentage observed was 53.

Loess and its main types, P. I. KRISHTAFOVICH (*Zap. Novo-Alexandri. Inst. Selsk. Khoz. i Lyesov., 15 (1902), No. 3, pp. 1–293; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 4, pp. 531–535*).

Origin of the loess, P. ARMASHEVSKI (*Trudui Geogr. Com., 15 (1903), No. 1; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 4, pp. 529, 530*).—The author holds the "diluvial" theory of the origin of the Russian loess.

History of the steppes near the Black Sea from the end of the tertiary period, N. SOKOLOV (*Pochvovyedenie [Pédologie], 6 (1904), No. 2, pp. 105–124*).

Some geobotanical observations on the North Ural, N. VISSOTSKI (*Pochvovyedenie [Pédologie], 6 (1904), No. 2, pp. 153–155*).—During a geological excursion on the North Ural Mountains the author observed the existence of a very strict parallelism between the petrographic character of the soil and the character of the forest growth. On olivin rocks there are usually found pine forests, in the regions of metamorphic schists fir forests, while intermediate rocks (peridotite, gabbro) were covered by mixed wood.

Bibliography and cartography of West Virginia, S. B. BROWN (*West Virginia Geol. Survey Bul. 1, pp. 85, map 1*).—The bibliography includes works on the geology and natural resources of West Virginia, issued during the period from 1764 to 1901, and the cartography covers the period from 1737 to 1901.

FERTILIZERS.

Bacteria of horse manure and their rôle in the decomposition of the manure, SEVERIN (*Vyestnik Imp. Russ. Obsh. Akklim. Zhiv. i Rast., No. 11, pp. 15, 16; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 3, p. 413*).—An account is given of experiments supplementing those previously reported (E. S. R., 15, p. 1062).

In the first place, the author studied the influence of the method of sterilization on the subsequent progress of the ammoniacal fermentation of the urine in the mass of manure. One portion of the urine was sterilized, together with the manure, in an

autoclave, while another was sterilized by being passed through a Chamberland filter and then mixed with manure which had been sterilized in the usual way (i. e., by hot steam in the autoclave). In the fermentation which took place after inoculating both portions with a pure culture of *Bacillus pyocyaneus* the same amount of carbon dioxid was liberated in both cases, while the urine which had passed the Chamberland filter liberated under like conditions 37 per cent more ammonia. This is accounted for by a loss of ammonia in sterilization.

The author describes some cases observed by him of extreme variation in the growth and life activity of the micro-organisms in manure, the cause of which could not be detected, e. g., one and the same organism vegetated splendidly in one case, while in another on the same medium it refused entirely to grow.

In a third series of experiments, undertaken with the object of studying the influence of the sterilization of the manure on its subsequent decomposition, manure extracts and pure cultures were used and the amounts of carbon dioxid and ammonia liberated in each case were determined. It was found that the oxidation processes were the same in both unsterilized manure and in that which had been sterilized and then inoculated. From the manure with which the extract was used considerably more carbon dioxid was liberated than in case of the pure cultures.

Three times as much ammonia was set free in the case of the unsterilized soil as in the case of the soil which was first sterilized and then inoculated. This is partly accounted for by the loss of ammonia in the sterilization, but, according to the author, a part is also played by some biological factors which have not as yet been fully studied.—P. FIREMAN.

Lime as a preservative for barnyard manure, S. HALS (*Norsk. Landmandsblad, 23 (1904), No. 33, pp. 392–395*).—A review of the literature of the subject, from which the general conclusion is drawn that the effect of lime may be deleterious and its use is therefore, according to our present knowledge, not to be recommended.—F. W. WOLL.

Liquid manure cisterns, R. CHRISTIANI (*Ugeskr. Landm., 49 (1904), No. 35, pp. 395–397*).—Notes with illustrations on method of construction.

Manures and how to mix them (*Trinidad Bot. Dept., Bul. Misc. Inform., 1904, No. 42, p. 61, fig. 1*).—A diagram is given showing what fertilizing materials may be safely mixed and how long they may be mixed before applying to the land, and its use explained.

On the effectiveness of phosphoric acid of manure as compared with that of Wolters phosphate, superphosphate, and Thomas slag, W. SCHNEIDEWIND and D. MEYER (*Landw. Jahrb., 33 (1904), pp. 342–347; abs. in Chem. Centbl., 1904, II, No. 10, p. 788*).—In experiments with mustard and oats the phosphoric acid of horse and cow manure compared favorably with that of superphosphate and corresponded closely with its citrate solubility.

Wolters phosphate, prepared by fusing raw phosphate with lime, sand, and glass, compared favorably with superphosphate on mustard and oats, and was much more effective than Thomas slag. Its after-effect was somewhat more pronounced than that of superphosphate. More of the phosphoric acid of Wolters phosphate was assimilated than in case of the Thomas slag, but less than in case of superphosphate. The more soluble the phosphoric acid the greater the amount assimilated, but the smaller the amount of organic matter produced per unit of phosphoric acid.

Wolters phosphate, E. WEIN (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 47, pp. 294–298*).—Field experiments with this phosphate in comparison with superphosphate, Thomas slag, and bone meal on mustard, potatoes, oats, and grass on loam, moor, and calcareous soils are reported. The general conclusion drawn from these experiments is that Wolters phosphate is fully equal in value to superphosphate and

superior to the other phosphates tested. These results confirm those reported by Wagner and Gerlach (E. S. R., 15, p. 571).

The quality of the Thomas slag employed in Carinthia in the year 1903, F. SCHULZE (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 10, pp. 742–745*).—Determinations of total and citric-acid-soluble phosphoric acid in a number of samples of Thomas slag are reported.

The determinations of the total amount of material dissolved in 2 per cent citric acid by evaporating an aliquot of the citric-acid solution, incinerating, and weighing, and of the undissolved material left on the filter by drying, incinerating, and weighing, gave such variable results that no conclusions could be drawn as to their bearing upon the relative value of the slags.

Phosphate shipments (*Tradesman, 52 (1905), No. 9, p. 128*).—A table shows the shipments of phosphate from southern ports to domestic and foreign destinations in 1902 and 1903. The total domestic shipments in 1903 were 218,246 tons, foreign 766,302 tons, as against 237,506 tons and 751,216 tons, respectively, in 1902.

Rock phosphate, B. C. ASTON (*New Zealand Dept. Agr. Rpt. 1904, pp. 144–146*).—The phosphates which are found in large deposits in the southern portion of New Zealand are briefly described, and results of partial chemical analyses are reported.

The utilization of free nitrogen, A. WIESLER (*Ztschr. Angew. Chem., 17 (1904), No. 45, pp. 1713–1719*).—This article reviews the history of attempts to fix the free nitrogen of the air by means of electrical discharges, describing the more important processes which have been devised and comparing their relative efficiency. It also gives some account of Woltereck's method of fixing nitrogen by passing the air over red-hot iron, and of the method of fixing atmospheric nitrogen in the form of calcium cyanamid.

The following table, prepared by E. Rasch,[a] showing the relative efficiency of different electrical methods, is quoted:

Relative efficiency of different electrical methods of fixing atmospheric nitrogen.

Method.	Temperature.	NO produced.	Total energy used— For 1 molecule of NO.	Total energy used— For 1 kg. HNO_3.	Cost per pound of nitric acid.
	Degrees.	*Per cent.*	*Kilowatt.*	*Kilowatts.*	*Cents.*
Muthmann and Hofer's method	1,800	3.65	0.5500	8.73	2.60
Rasch's resistance heating method	2,115	7.30	.3190	5.07	1.50
Rasch's arc-light heating method	3,727	46.00	.1391	2.21	.66

The migrations and transformations of nitrogen in nature and its utilization and control in agricultural practice, P. WAGNER (*Arb. Deut. Landw. Gesell., 1904, No. 98, pp. 28–46*).—A general discussion of the importance of conserving and utilizing to the best advantage various sources of nitrogen—leguminous plants, barnyard manure, nitrates and sulphate of ammonia, and "lime nitrogen."

A contribution to the subject of the fertilizing value of lime nitrogen, ZIELSTORFF (*Illus. Landw. Ztg., 24 (1904), p. 1103; abs. in Chem. Ztg., 28 (1904), No. 101, Repert. No. 30, p. 370*).—Pot experiments to determine the relative value of nitrate of soda, sulphate of ammonia, and lime nitrogen are reported.

When the fertilizing materials were applied at time of seeding the lime nitrogen showed an efficiency of 88.4 per cent, as compared with 100 per cent for nitrate of soda and 81.1 per cent for sulphate of ammonia. When the lime nitrogen was applied a few days before seeding its relative efficiency was increased to 92.8 per

[a] Dingler's Polytech. Jour., 318 (1903), p. 268.

cent. There was no appreciable after-effect from applications of the lime nitrogen. The growth of the plants was apparently somewhat retarded by applying the lime nitrogen as a top-dressing.

Liming, A. ORTH (*Arb. Deut. Landw. Gesell., 1904, No. 98, pp. 79–90*).—A general discussion.

Nitrate of soda (*Engin. and Min. Jour., 79 (1905), No. 1, p. 64*).—The American consumption of nitrate of soda in 1904 is reported as 275,000 long tons; the European consumption was 1,105,000 tons; the local consumption (in Chile and neighboring countries) 28,000 tons.

Nitrate profits (*Engin. and Min. Jour., 79 (1905), No. 3, p. 130*).—The world's consumption of nitrate of soda is stated in this article to be about 1,450,000 long tons, containing 1,349,100 tons of nitrogen. The cost to consumers during 1904 was from $40 to $48 per ton, which is about $10 more per ton than in 1903. The possibilities of a further rise in price are discussed.

The action of nitrate of soda as a potassic and calcareous fertilizer, T. BIÉLER (*Chron. Agr. Canton Vaud, 17 (1904), Nos. 11, pp. 332–335; 12, pp. 353–362; 13, pp. 383–390; 14, pp. 409–417; 16, pp. 462–475; 17, pp. 508–517*).—The author reviews the work of various investigators in so far as it bears on the question of the action of nitrate of soda in rendering plant food soluble in soils.

The observations noted apply to sandy clay soils, and lead to the conclusion that nitrate of soda exerts a fertilizing effect independent of the direct supply of plant food which it supplies, in rendering the potash and lime of the soil soluble, and thus acts as an indirect potash and lime fertilizer. In soils containing small amounts of lime nitrate of soda renders potash soluble more completely than superphosphates, sulphate of ammonia, gypsum, etc., and to a greater depth, because (a) the nitrate of potash formed moves more freely in the soil than other potash salts, and (b) the calcium nitrate formed also moves freely through the soil and assists in the mobilization of the potash.

To this extent nitrate of soda may be considered an indirect potassic fertilizer. It may also be so considered because it renders assimilable soil potash which is insoluble in acids by the ordinary treatment.

It is also to be noted that commercial nitrate of soda often contains an appreciable amount of potash and the effect sometimes attributed to the soda may, in fact, be due to this potash. On soils rich in potash potassic fertilizers may be entirely dispensed with when nitrates in connection with phosphates are used, especially in case of hoed crops.

In any case potash fertilizers may be economized by the use of nitrates (either of soda or of lime) or by promoting nitrification in the soil. Nitrate of soda, like the sulphates of potash and ammonia and chlorid of potash, acts as an indirect lime fertilizer by mobilizing the lime in the soil.

Unless the soil is very rich in lime, liming should accompany the use of these substances.

Action of calcium compounds on the mobilization of potash in soils, J. DUMONT (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 5, pp. 379–384*).—The solvent effect of quicklime, calcium carbonate, gypsum, calcium chlorid and nitrate, and monocalcium phosphate on the potash of different soils and different grades of soil particles was studied in laboratory experiments.

The results reported show that when a granitic soil was mixed with gypsum and calcium chlorid at rates furnishing 10 per cent of lime (CaO) and moistened, the gypsum rendered soluble 0.048 part of potash per 1,000 of soil in 28 hours, 0.073 part in 10 days, and 0.096 part in 4 months. The calcium chlorid rendered 0.115 part of potash soluble in 28 hours, and there was no increase by further treatment. The comparative results obtained in a one month's experiment were as follows:

Potash rendered soluble in a granitic soil during one month by different lime compounds.

	Potash rendered soluble per 1,000 parts of soil.	
	Total.	Increase.
Check	0.270	....
Gypsum	.310	0.040
Quicklime	.340	.070
Calcium carbonate	.420	.150
Calcium nitrate	.530	.260
Monocalcium phosphate	.700	.430
Calcium chlorid	.720	.450

In experiments with the sand and clay constituents of the same soil, using the calcium salts at the rate of 1 gm. of lime (CaO) to 10 gm. of the soil constituents and 40 cc. of distilled water, the following results were obtained:

Potash rendered soluble in different mechanical constituents of a granitic soil.

	Potash rendered soluble—		
	In coarse sand.	In fine sand.	In clay.
	Per cent.	*Per cent.*	*Per cent.*
Check	0.105	0.168	0.132
Quicklime	.184	.195	....
Gypsum	.105	.184	.132
Calcium nitrate	.124	.193	....
Calcium chlorid	.278	.232	.350

This experiment lasted 34 days for the different grades of sand and 6 days for the clay. The coarse sand contained 1.33 per cent of potash, fine sand 0.58 per cent, and clay 0.51 per cent.

The action of sodium chlorid on field crops (*Deut. Landw. Presse, 31 (1904), No. 101, pp. 842, 843*).—This is a brief discussion of the fertilizing value of common salt, based mainly upon the results of experiments by Wohltmann and Noll. The general conclusion is drawn that moderate applications of salt are of little or no value to cereals, that they are injurious both quantitatively and qualitatively to potatoes, but that they favorably influence the sugar content of beets.

Home-mixed fertilizers, C. D. Woods (*Maine Sta. Bul. 107, pp. 129–152*).—This bulletin discusses the advantages and disadvantages of home mixing; reports results of cooperative experiments on home mixing with farmers in Brunswick, Houlton, and Fort Fairfield, Maine; gives results of comparative tests of the home mixed and factory mixed goods on potatoes in Aroostook County; explains methods of mixing fertilizers with analyses of the more common fertilizing materials and explanations of the general principles involved, and suggests formulas for home mixtures of fertilizers for the more common farm crops. Analyses are reported which show that the composition of the home-mixed fertilizers was in close agreement with that calculated from the analyses of the unmixed materials and the mechanical condition of the mixtures was good.

Commercial fertilizers, E. H. Jenkins et al. (*Connecticut State Sta. Rpt. 1904, pt. 1, pp. 104 + VII*).—This includes a statement of the duties of manufacturers and dealers and of the experiment station in connection with the inspection under the State fertilizer law, a list of firms licensed to deal in fertilizers in the State during 1904, notes on the methods followed in sampling and collecting fertilizers, explanations regarding the analysis and valuation of fertilizers, and a review of the fertilizer market from November 1, 1903, to September 30, 1904.

Tabulated analyses and valuations are given of 508 samples of fertilizing materials, including nitrate of soda, sulphate of ammonia, dried blood, cotton-seed meal, castor pomace, linseed meal, phosphate rock, dissolved rock phosphate, carbonate of potash, double carbonate of potash and magnesia, sulphate of potash, double sulphate of potash and magnesia, muriate of potash, kainit, "domestic potash," bone manures, slaughterhouse tankage, dry ground fish, nitrogenous superphosphates, special manures, home mixtures, tobacco stems, tobacco dust, vegetable ash compound, wood ashes, cotton-hull ashes, ashes from limekilns and brickkilns, ashes of birch brush, lime, and plaster.

The fertilizer industry in the South (*Tradesman, 53 (1905), No. 9, pp. 128, 129*).—A table gives the number of establishments, capital invested, and value of products for 12 Southern States. The totals are: Number of establishments, 205; capital invested, $37,189,262; cost of materials, $16,075,357; value of products, $24,-640,131. The fertilizer tonnage for the Southern States during the year ended May 31, 1904, is reported as 2,441,887 tons. The consumption of fertilizers in Georgia alone during the season of 1903–4 was 689,916 tons.

Under what conditions can commercial fertilizers be most profitably employed? (*Deut. Landw. Presse, 31 (1904), No. 103, p. 863*).—A brief general discussion of this subject with special reference to kind of crop grown; and form, amount, and time and manner of application of the fertilizer.

FIELD CROPS.

Agricultural experiments and the presentation of their results, A. Mitscherlich (*Landw. Vers. Stat., 61 (1904), No. 1–4, pp. 285–303*).—This article discusses the different conditions to be considered in planning field experiments and the method of arriving at the results, and the recognition and omission of unreliable tests.

Report of the agricultural branch of the department of land records and agriculture, Bengal, 1904, S. L. Maddox (*Calcutta: Bengal Secretariat Press, 1904, pp. 32*).—The results of agricultural investigations under imperial and provincial control and direction are reported, together with information on agricultural and sericultural education.

It was found that crude nitrate of soda can not be recommended as a fertilizer for rice. Its use in connection with irrigated wheat culture increased the yield in one instance by about 50 per cent. A number of fertilizer experiments with rice, jute, sugar cane, potatoes, and wheat are reported. The use of 10 maunds of castor cake per acre increased the yield of rice, but failed to give a profit.

Tests in sowing jute indicated that 9 lbs. of seed per acre generally gives the best results. It has been discovered that the seed of the shoots of paddy coming up after the first cutting are highly drought-resistant and prolific, and the results of experiments here reported corroborate this discovery. Jute plowed under for green manuring was more effective in increasing the yield of paddy than cow manure. *Sesbania aculeata* has been found to be well adapted to plowing under for green manure. Castor cake in quantities sufficient to furnish 100 lbs. of nitrogen per acre proved to be the best fertilizer for potatoes.

Paddy sown at the rate of 60 lbs. per acre yielded 1,641 lbs., as against 2,016 lbs. from sowing 30 lbs. per acre. Fertilizing wheat with poudrette sufficient to furnish 40 lbs. of nitrogen per acre gave better yields than any other fertilizer tested. In this test green manuring with sun hemp gave better results than the use of other crops for this purpose. Brief notes are given on tests with new varieties of rice, wheat, and oats.

Investigations on the rooting and tillering of grains, K. Opitz (*Mitt. Landw. Inst. K. Univ. Breslau, 2 (1904), No. 4, pp. 749–812; abs. in Deut. Landw. Presse, 31*

(1904), No. 47, p. 426).—The results of experiments by different investigators, together with literature on the subject, are reviewed at some length and the author's own work is described. A bibliography of 78 references is given.

It is concluded from the results that on soils with proper subsoil cereals draw part of their water supply from the lower strata, and that their roots have the capacity to grow deep into the soil independent of worm or old root channels. The roots of oats at the time of heading and maturity of the plants were heavier than the roots of wheat and barley. It was also found that in the weight of the root system the more readily grown varieties ranked above those requiring more favorable conditions of growth. During the early stages of growth development was comparatively greater in the root than in the portion above ground, and this was particularly true with wheat as compared with oats and barley.

Observations on the tillering capacity did not show that in general the most productive varieties tillered less than those producing smaller yields. Chevalier barley was grown at different distances so that the area per plant ranged from 10 sq. cm. to 5,000 sq. cm., and the results show that the distance had a marked effect on tillering, period of growth, straw and grain production, length and weight of head, and the number of kernels produced per head; and that this effect was favorable in so far as each point was favored by the increase in area per plant. These results, however, are not considered generally applicable to other than plat conditions.

The development of the roots and the consequent withdrawing of plant food from the soil was no less where the plant was given 50, 105, or 200 sq. cm. than where it was given 10 or 32 sq. cm. Every stem of the barley plants showed about the same root development regardless of the distance between plants, thus showing that in root production the stem was independent of the plant. Soil in good physical condition, but poor in plant food, gave a better yield than rich soil in poor physical condition.

Alfalfa, C. D. WOODS (*Maine Sta. Bul. 106, pp. 127, 128*).—A brief review is here given of the attempts to grow alfalfa in New England.

A test with eight varieties of barley, R. S. SETON (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council [Pamphlet] 39, 1903, pp. 10*).—The experiments with barley showed that from $2\frac{1}{2}$ to 3 bu. of seed per acre gave the best returns in yield and quality. A dressing of 5 cwt. of salt per acre on medium loam or light soil in good condition, indicated an improvement in yield and quality. For this same kind of soil in only moderate condition, the use of 1 cwt. of sulphate of ammonia and 2 cwt. each of superphosphate and kainit are recommended for barley culture.

The influence of artificial manures on the yield, chemical composition, and malting qualities of barley, H. HUNTER (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council [Pamphlet] 37, 1903, pp. 12*).—The results obtained indicated that nitrogen in a complete fertilizer application does not involve a correspondingly higher proportion of nitrogen in the grain. The use of phosphatic manures largely increased the yield but did not increase the proportion of phosphoric acid. Potash apparently influenced the yield of grain less than the other elements, but with its use the potash content of the grain was increased.

With reference to quality, the best results came from the use of a complete fertilizer application, the percentage of nitrogen in the grain being lowest and the percentage of potash highest; and this was accompanied by the highest proportion of extract and the highest diastatic capacity in the malt. The complete applications were also most effective in increasing the yield.

The culture and drying of chicory (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 10, pp. 1191–1200*).—The condition of the chicory industry in England and Belgium is described. The methods of culture followed in the two countries are discussed and a comparison of the production of dried chicory from an economic point of view is presented.

Influence of the color of seeds on the yield of clover, V. KHARCHENKO (*Vyestnik Selsk. Khoz., 1903, No. 43; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 3, p. 400*).—A series of experiments was carried on to test the claim of Fruwirth that yellow clover seeds yield larger crops than variegated ones. Different lots of Russian and American clovers were examined and divided according to the color of the seed, after which the samples were sown, but it was later found that the soils were hardly comparable. It is believed, however, that the yield of hay in the case of the yellow seed was slightly greater than that produced from variegated seed.

Incidental to the other investigation, the author determined the percentage of the different colored seeds, and found that on an average the Russian clovers contained 35.89 per cent of variegated seed, 18.77 per cent yellow, 15.91 per cent brown, 26.84 per cent intermediate, and 1.35 per cent weed seed, and 1.25 per cent of dirt; while for the American clovers the figures are 32.9 per cent variegated, 20.3 per cent yellow, 19.07 per cent brown, 20.47 per cent intermediate, with 3.98 per cent weed seed, and 3.48 per cent of dirt.

The germinative capacity of the variegated, yellow, and brown seeds in the Russian varieties were 87 per cent for the variegated, 85.6 per cent for the yellow, and 13.6 per cent for the brown; for the American samples the figures were 94.7 per cent for the variegated seed, 94.2 per cent for the yellow, and 13 per cent for the brown. The brown seeds, which have such a uniformly low germinative capacity, were believed to be caused by the prolonged action of rain on the seeds, and this opinion seems to be confirmed by laboratory experiments in wetting and drying seeds for a considerable time.—P. FIREMAN.

Hairy or sand vetch and bur clover, B. W. KILGORE, C. B. WILLIAMS, and R. W. POU (*Bul. North Carolina State Bd. Agr., 25* (*1904*), *No. 7, pp. 35, figs. 13*).—The culture, uses, and value of these leguminous crops are discussed. The average yield of air-dry material of hairy vetch obtained for two years amounted to 4,060 lbs. of stems, leaves, pods, and blossoms, and 1,489 lbs. of roots and 2-in. stubble per acre; and for bur clover the corresponding figures were 5,842 and 1,131 lbs. per acre. The composition and fertilizing value of the two crops are given in tables.

It is stated that soil which has produced green peas with nodules upon their roots can be used for inoculating soil for the vetch crop. The observation was made that the bacteria of sweet clover and bur clover will inoculate alfalfa.

The mangel and its cultivation, A. HOLM (*Transvaal Agr. Jour., 3* (*1904*), *No. 9, pp. 40–45*).—General directions for the culture of mangels are given, and the results of a fertilizer experiment with the crop are shown in a table. Yellow Globe mangels were grown on a reddish loam soil with a gravelly subsoil, and commercial fertilizers were applied with and without barnyard manure.

The largest profits were secured from the use of 200 lbs. of nitrate of soda, 400 lbs. of superphosphate, and 150 lbs. of sulphate of potash, followed by an application in which the potash in this formula was replaced by 10 tons of barnyard manure per acre.

Oats, R. W. PEACOCK (*Agr. Gaz. New South Wales, 15* (*1904*), *No. 8, pp. 765–772, figs. 8*).—A classification of the types of oats and general directions for the cultivation of the crop are given. A list of varieties is presented, in which the chief character of each group is pointed out. In a test of different varieties those maturing early gave the highest yields, and those maturing late, the lowest. Of the intermediate varieties, Abundance ranked first. Algerian and Red Rust-proof were comparatively rust resistant. A yield of 62 bu. per acre is recorded for Algerian.

On the difference in behavior of potatoes and fodder beets toward crude and pure potash salts, W. SCHNEIDEWIND and D. MEYER (*Landw. Jahrb., 33* (*1904*), *pp. 347–353*).—Pot experiments were conducted to study the influence of different potash salts, as well as the effect of common salt, on potatoes and fodder beets.

Each pot contained 9,000 gm. of dry soil, consisting of 90 per cent of sand and 10 per cent of humus clay. A general fertilizer application of 1 gm. each of ammonium sulphate and ammonium nitrate, 2 gm. of double superphosphate, 1 gm. of magnesium sulphate, and 10 gm. of calcium carbonate was given each pot.

A series of 6 pots was used for each individual test, and the data given in the table below have reference to an entire series:

The influence of different potash salts and common salt on potatoes and fodder beets.

Fertilizers applied per series of pots.	Potatoes.					Fodder beets.		
	Yield of tubers.	Dry matter.		Starch.		Yield of beets.	Dry matter.	
	Gm.	*Gm.*	*P. ct.*	*Gm.*	*P. ct.*	*Gm.*	*Gm.*	*P. ct.*
No potash	1285.7	291.7	22.69	217.2	16.89	1128.6	117.4	10.40
5.571 gm. K_2O as potassium sulphate	2269.6	557.0	24.54	425.3	18.74	2375.9	268.5	11.30
5.571 gm. K_2O as potassium sulphate +30 gm. of sodium chlorid	2170.3	594.4	24.06	451.1	18.26	3081.2	381.8	12.39
11.142 gm. K_2O as potassium sulphate	2913.4	735.3	25.24	566.4	19.44	3105.6	307.1	9.89
11.142 gm. K_2O as potassium sulphate +30 gm. of sodium chlorid	2630.6	627.4	23.85	474.8	18.05	4122.6	439.1	10.65
11.142 gm. K_2O as potassium chlorid	3080.4	774.8	25.15	596.1	19.35	3247.8	361.2	11.12
11.142 gm. K_2O as kainit	2693.7	634.6	23.56	478.4	17.76	3834.6	422.6	11.02
11.142 gm. K_2O as potassium silicate	2524.2	593.7	23.52	447.3	17.72	3109.1	394.2	12.68
11.142 gm. K_2O as potassium carbonate	2530.5	581.0	22.96	434.2	17.16	2883.6	344.3	11.94
11.142 gm. K_2O as sugarhouse refuse	2463.8	570.9	23.17	428.0	17.37	2497.5	589.7	11.60

The addition of sodium chlorid to a small application of potassium sulphate slightly increased the yield of potatoes, and with a large application of the sulphate it decidedly decreased the yield. With beets there was an increase of yield, especially with the larger application.

The dry matter (and starch) in potatoes was decreased by the use of salt, but the dry matter of beets was slightly increased by its use. The sodium content of the leaves and vines only of potatoes was increased by use of salt, while the general soda content of beets was increased. On the other hand, the chlorin content of both leaves and vines and the tubers of potatoes was increased. Kainit gave poorer results on potatoes and better results on beets than pure salts. The assimilation of soda and chlorin was similar to that observed in case of addition of salt to the pure sulphate.

The silicate and carbonate of potash and molasses-refuse fertilizer gave poorest results on potatoes. On beets the two former were but slightly inferior to pure sulphate and chlorid, while the molasses-refuse fertilizer gave poorer results.

Report on tests of varieties of potatoes, R. S. SETON (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council* [*Pamphlet*] *35, 1902–3, pp. 13*).—It is concluded from the results that Up-to-date, British Queen, Scottish Triumph, General Roberts, Charles Fidlder, Conquest, Challenge, and British Lion are reliable varieties. Sets yielded as good crops as whole seed. Liming the cut surface of sets is recommended when these can not be planted immediately.

A comparison of crops from seed of 4 varieties grown at Garforth for 3 years, and of seed of the same varieties procured this season from the same original source, showed a marked increase in favor of the new seed, and it is suggested that the same stock should not be used on the same farm for more than 3 years. The crop from the new seed was also free from diseased tubers, while in the crop from the old seed the percentage of diseased tubers ranged from 13.82 to 33.19.

Safflower and safflower oil, K. Ippolitov (*Khozyain, 1903, Nos. 1, 2; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 3, pp. 403, 404*).—The author gives, on the basis of 4 years' experience, what he considers the best method of cultivating safflower.—P. FIREMAN.

Soy beans in Maine, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 106, pp. 113–121*).—Several varieties of soy beans were grown at the station in 1903 and 1904. The early white soy bean matured, and the medium early green and black varieties formed pods. Henderson Early in earliness and yield was as satisfactory as any of the varieties tested. The largest yield in 1903 from drills 3 ft. apart was only a little over 5 tons per acre, but it is believed would have been nearly or quite doubled if the drills had been placed 16 in. apart.

Soy bean and corn silage in the proportion of about 14 of corn to 9 of beans kept perfectly and was eaten with great relish by stock.

The influence of sodium salts in the soil on the composition of sugar cane, H. C. Prinsen Geerligs (*Separate from Meded. Proefstat. Suikerriet West Java, 1904, No. 76, pp. 14*).—The subject is discussed and the results of different investigators who have worked along this same line are reviewed. The ash constituents of juices from canes grown on soil with different salt content are shown in a table.

The author found that an application of a solution of either sodium chlorid, calcium chlorid, or magnesium chlorid to the soil caused an increase of potash in the ash of the cane, as compared with cane grown in soil not treated with chlorids. Where the sodium chlorid was applied the sodium content also increased, but not to the same extent as potash, being only 18 per cent of the potash content in the cane containing the largest quantity of sodium.

It is concluded from these results that a reaction between sodium chlorid and the silicate or carbonate of potash takes place, by which chlorid of potash is formed, which can be taken up by the plant.

Sweet-potato culture, M. B. Waite (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 54–62, pls. 3*).—The author gives an account of his methods of growing sweet potatoes in Maryland. He has been very successful in growing them as an intercultural crop in the orchard, and states that in his Kieffer pear orchard the trees came into bearing at 5 years of age and bore from 3 to 5 bu. of good pears where sweet potatoes had been a regular crop. Where the potatoes had not been planted the pears were not so good, and the yield of fruit was only one-quarter to one-half the amount obtained where the sweet potatoes were grown.

Success in dry weather has been obtained by setting the plants out after dipping the roots in a thin, cream-like mixture of clay and water. The author believes that even better results are obtained by this method than where they are planted out in a rainy time. Transplanting is done by machinery, and this can be successfully worked only in dry weather.

The fire hotbed is regarded as much more efficient for raising plants than the manure hotbed. The attempt is made to keep the beds up to at least 90° F.; 98 to 100° will do no harm, but is not considered quite as desirable as a temperature of between 80 and 90°. The temperature should not be allowed to drop below 60°. The author believes that while good plants can be obtained by running a bed pretty dry, more plants can be obtained by keeping the furnace hot and the bed damp.

The Big Stem Jersey is the variety grown, as it has been found best in quality and the best producer. Seed is obtained from those hills which yield from 6 to 18 marketable potatoes.

The potatoes are put in the storage house as soon as dry, and the house warmed up to a temperature of at least 60° or above. With only a small quantity of potatoes in the building a lower temperature may be used, but in the author's storage house, where there are about 1,000 bbls. in one room, a temperature of about 90° is considered

best. The author stores in bulk and not in barrels. When the room begins to get dry and dusty the temperature should be lowered, first to 75 or 70°, and then down to below 60°. The temperature preferred is between 55 and 60°.

The sweet potato, G. L. SUTTON (*Agr. Gaz. New South Wales, 15 (1904), Nos. 8, pp. 773–780, figs. 5; 9, pp. 881–889, figs. 9*).—The culture of the sweet potato is discussed at some length, and the results of experiments in early and late harvesting are summarized in tables. The yield of each variety was very much increased, and in most cases it almost doubled itself from April 4 to June 22.

Varieties of tobacco cultivated at the Royal Tobacco Experiment Station in 1903 (*Il R. Instituto Sperimentale per le Coltivazioni dei Tabacchi e la Visita del VII Congresso Internazionale D'Agricoltura. Rome: Ministero delle Finanze, 1903, pp. 57–60*).—A list of 222 varieties of tobacco grown at the station is included in the description of the institution and its special lines of work.

Wheat culture in the Province of Buenos Ayres, and the varieties of wheat grown in the southern part of this province, C. D. GIROLA (*El cultivo del trigo en la provincia de Buenos Aires y los trigos del sud de la misma. Buenos Ayres: P. Gadola, 1904, pp. 114, figs. 14, maps 2*).—Statistics on the production of wheat in Argentina, as well as in the province of Buenos Ayres, in 1902–3 are given, and the culture of wheat under Argentine conditions is discussed. One hundred samples, representing the different varieties and sections of the province, are noted in tabular form. The impurities in seed wheat are considered at some length. The principally grown varieties of the country, including 9 bread and 3 durum wheats, are described in detail.

Report on a test of fourteen varieties of wheat at Garforth, 1903, R. S. SETON (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council [Pamphlet] 34, 1903, pp. 13*).—The best yield of grain of good quality was obtained from Carter Royal Prize, which ranked first in quality with Standard Red and Scholey Squarehead. The yields of 4 American varieties, Ottawa Percy, Ottawa Red Fife, Ottawa Preston, and Minnesota were unsatisfactory.

A test of sixteen varieties of wheat at Garforth, R. S. SETON (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council [Pamphlet] 45, 1904, pp. 13*).—In 1904 the Red wheats leading in yield and quality were Browick Grey Chaff, Squarehead Master, Windsor Forest, and Scholey Squarehead; and the White wheats, Hunter White and Carter White Standup. This season a slightly better crop of wheat was grown where the aftermath of the preceding crop of clover was grazed than where it was mown.

Manure experiments with wheat at Wagga, 1903, F. B. GUTHRIE and R. HELMS (*Agr. Gaz. New South Wales, 15 (1904), No. 3, pp. 274–282, dgm. 1*).—The experiments here reported have been in progress 3 years, and the earlier results have been previously noted (E. S. R., 14, p. 352). The soil under test did not respond to the use of lime, but the use of superphosphate gave good results. Unlimed plats receiving 200 lbs. of superphosphate per acre gave a higher yield than plats receiving in addition 60 lbs. of sulphate of ammonia and 30 lbs. of sulphate of potash. Where superphosphate was used alone 150 lbs. per acre gave the most profitable results.

The effects of Thomas slag were similar to those obtained from the use of superphosphate. The largest average yield was obtained on a plat receiving 300 lbs. of Thomas slag, 30 lbs. of sulphate of potash, and 35 lbs. of sulphate of ammonia in 1901 and 1902, and 30 lbs. of sulphate of potash alone in 1903. Florida rock phosphate was more effective than Pacific Island rock phosphate, but much better results than from either one of these substances were obtained from the use of phosphoric acid in the more soluble forms. In a series of tests with complete fertilizer applications the most profitable results were obtained from the use of 30 lbs. of sulphate of ammonia, 100 lbs. of superphosphate, and 15 lbs. of sulphate of potash.

Manure experiments with wheat, Bathurst farm, R. W. PEACOCK (*Agr. Gaz. New South Wales, 15 (1904), No. 8, pp. 760–764, figs. 5*).—Superphosphate, sulphate of ammonia, and sulphate of potash were applied in different combinations at the rate of 2, 1, and 5 cwt., respectively. Superphosphate alone increased the yield by 6 bu. of grain and 19 cwt. of straw. A complete mixture was not as effective as superphosphate, and sulphate of potash gave only a small increase. A plat receiving a complete mixture with only 1 cwt. of superphosphate yielded 1 bu. per acre less than the plat without fertilizer treatment.

The results show that the soil contains sufficient nitrogen and potash, but it is recommended not to apply superphosphate for a number of years without growing leguminous crops for the restoration of nitrogen.

Rust-resistant wheats, W. L. SUMMERS (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 8, pp. 441–443*).—Notes are given on the following rust-resistant wheats: *Early varieties*—Baroota Wonder, Carmichael Eclipse, Gluyas, Petatz Surprise, Rerraf, and Wiltunga Wonder. *Medium early varieties*—Leak Rust-proof, Leak Improved, Milne White, Ward Prolific, Budd Rust-resistant, Gamma, Majestic, Marshall No. 3, Gallant, Silver King, Phillis Marvel, and South Australian Wonder. Varieties which owing to their earliness usually escape damage by rust are enumerated, and the best rust-resistant sorts for certain districts are mentioned.

The chemical composition of Hungarian wheats, W. HANKÓ and J. GÁSPÁR (*Fühling's Landw. Ztg., 53 (1904), Nos. 18, pp. 699–706, figs. 3; 19, pp. 724–737*).—This article is an abstract of a paper presenting the results of an analytical study of Hungarian wheats. The methods of analyses used by the authors are described in detail, and the results obtained are given in tables. It is concluded that the quality of the principal Hungarian varieties, including weight and composition, is above all foreign wheats.

A review of analyses made at different periods of the last century shows that in general the composition of the wheats of the country has not changed, and this is stated to be especially true of localities where rational wheat culture is practiced. The moisture content of the Hungarian wheats is low, the gluten content high, and the proportion of bran at a minimum. On account of the high gluten content the percentage of nitrogen is large and the percentage of ash small.

Wilhelmina wheat, J. ROEMELING (*Deut. Landw. Presse, 31 (1904), No. 74, p. 636, figs. 2*).—The description and history of this newly bred variety of wheat are given.

HORTICULTURE.

Experiments and observations in the government botanical garden at Dresden, 1902–3, O. DRUDE, A. NAUMANN, and F. LEDIEN (*Separate from Jahresber. Flora, Dresden, 7 (1902–3), pp. 21, pls. 6*).—An account is given of extensive experiments in forcing plants by ether and chloroform, and of fertilizer experiments with azaleas and lilies of the valley.

Plants accustomed to winter weather are marked by periodical changes of growth and rest. The rest period begins sometime during the fall. Its completion depends upon certain metabolic changes within the plant itself. The plant normally is held in a condition of rest until the rising temperature of spring is sufficient to permit of growth. Forcing is the artificial production of an early spring. The rest period is essential for the completion of certain metabolic processes within the plant

Growth is hastened about a month sooner by the use of ether than it would normally be by heat alone. Ether or chloroform gas affects the plant probably by checking some of the changes within the plant cell, while at the same time increasing respiration. By too strong doses of ether or chloroform the plant may be killed. Sufficient but not too weak quantities hasten metabolism, after which forcing can take place.

As a result of a number of experiments, it was found that in October from 50 to 60 gm. of ether per hectoliter of space was found very beneficial in hastening growth. In November the normal dose is 40 gm. of ether; toward the end of November, however, even this amount may be somewhat harmful. In October the plants may be subjected to ether fumes for 48 hours. Toward the close of the rest period 24 hours may be sufficient. When ether is used it is not essential that the plants be previously subjected to cold. Experiments show that it is not necessary to place the plants immediately after etherization in the forcing house. Plants left exposed in the open 10 days or more lost none of the effects of the ether; in fact, they forced more readily and produced bloom in less time than those which were placed in the forcing house immediately after etherization.

Plants were killed when submitted to 40 gm. of ether per hectoliter for 4 days. When 60 gm. was used the plants were killed after 2 days' etherization. A dose of 75 gm. of ether at 10° C. or 23° C. proved deadly. Some data on the forcing effect of ether are as follows: Lilacs etherized October 19 produced bloom November 8. Another season etherized plants bloomed November 13. Etherization does not hasten the blooming period of lilacs if the rest period is completed before etherization takes place.

For successful results it has been found that the temperature at which lilacs should be forced must be about the same as for unetherized plants. Etherization is not equally effective for all plants. In the experiments at Dresden it was most beneficial for *Syringa vulgaris*, *Viburnum opulus*, and *Staphylea colchica*. It is less effective on *Prunus sinensis*, *Rhododendron sinense*, and *Viburnum tomentosum*. Early blooming shrubs such as Deutzias, *Prunus triloba*, and *Spiræa prunifolia* were not benefited at all by etherization during the months of October and November, and were in fact slightly injured, if anything, by etherization.

The details of the experiments upon which the above conclusions are reached are recorded at some length.

The fertilizer experiments with lily of the valley and azaleas did not give results from which definite conclusions could be drawn. A number of illustrations are given showing the effect on the blooming period of different plants by etherization.

Anesthetics in the forcing of plants, J. AYMARD, JR. (*Les anesthésiques et le forçage des plantes. Paris: Libraire Horticole, 1904, pp. 68, figs. 4*).—The work of the author on the etherization of a large number of plants, some of which has been previously noted (E. S. R., 16, p. 158), has been incorporated into book form.

Sweet corn: Breeding, growing, and curing for seed, A. STABLER (*Maryland Sta. Bul. 96, pp. 31–43*).—This bulletin was written for the purpose of showing that sweet-corn seed equal to that obtained from New England can be grown in Maryland. The prevailing opinion that northern-grown seed gives a sweeter corn than the home-grown seed has been found by investigations not to hold for Maryland.

One grower in Carroll County has been planting and saving his own seed of Moore Early Concord sweet corn for 30 consecutive years without change. Its quality is believed to be better now than it was originally. This grower is of the opinion that earliness is secured by planting the sweet corn late, about July 4, while sweetness is not affected by time of planting. "He saves for his early planting the following year corn from the latest planting that will mature and finds that by so doing he is able to keep it small and early."

It was found that by saving seed from the earliest maturing ears of the early planting the corn became larger and later. In the author's case, however, earliness has been maintained only by saving the earliest ears from the early corn.

The history of the Roslyn Hybrid sweet corn, developed by the author in Maryland in 1879, is given. It was obtained by planting alternate rows of Burr Mammoth and Stowell Evergreen, and removing the tassels and tillers from the Stowell variety before the blossoming period. The hybrid obtained had all the desirable

points of a canning variety, such as large ear, straight rows, white silk, deep grain, small cob and foot stalk, while the yield was larger than from a number of other varieties grown.

The case of Mr. S. N. Hyde is cited, who began the growing and canning of Egyptian sweet corn in 1878 and continued for 25 years without change of seed. The canned corn produced by him, it is claimed, brought the highest price of any on the American market.

C. W. Baker, of Harford County, has also been growing corn during the past 25 years without change of seed, and in 1900 grew a crop of 500 acres. He plants a special strain of small-grained Evergreen, which he originally obtained from Connecticut. It is asserted that the reason why Maine-canned sweet corn is sweeter than the product from other places is because the canners add sweetening to the product at the time of canning.

Some data are given on the rainfall and mean temperature of Connecticut and various points in Maryland which indicate that the precipitation during the months of May to September is very similar in both States, while the mean temperature is considerably higher in Maryland. One of the reasons why sweet-corn seed obtained from Connecticut does not yield as well in Maryland as Maryland-grown seed is believed to be that the corn in Connecticut is grown on low ground near the sea in a humid climate, on highly manured and intensely cultivated soil. In western Maryland, however, while the climate is not exactly a dry one, there are often heavy storms during the summer with 2 or 3 weeks of dry weather intervening, when the soil on the hillsides becomes dry and cultivation is omitted for fear of injuring the corn. "A corn that has never had to stand such conditions curls up and stops growing much quicker than the deep-rooted native varieties. Nor are these deep-rooted plants necessarily of poor quality, for the 'Egyptian,' which possesses great heat and drought resisting power, is one of the most sweet and tender of all sweet corns."

A number of suggestions are given for different methods of curing corn, including the method usually observed in Connecticut. The writer's method in Maryland, which has given uniformly good results, is to cut down the corn when it is well matured, on a bright, clear day, and husk it out into small piles in the forenoon. In the afternoon the corn is put on a slatted floor made of lath 1 in. thick by 2 in. wide, spaced 1 in. apart. The slats should be covered with corn about a foot deep, but so loosely arranged that there is no obstruction to the passage of air between the ears. In this position it dries very quickly, and may be put into barrels as soon as all moisture is out of the cob. Another grower makes an air-tight bin with a slatted false floor about 6 in. from the bottom. Air is then forced up through the grain by a fan, which is reported to dry out the grain in a remarkably short time.

Fermentation and freezing are given as 2 of the causes of imperfect germination. "Corn thrown in a large pile, with or without the husk on, will develop heat enough inside of 24 hours to injure the germ, sour the cob, and discolor the grain. Sweet corn cut and shocked up like field corn will sour before it dries, unless the weather be both cool and dry enough before winter to escape injury by freezing. Corn left on the stalk untouched until the husk opens will be greatly discolored and injured by a spell of hot damp weather."

The advantages and opportunities for growing sweet-corn seed in Maryland are pointed out in considerable detail. It is believed that the conditions for growing and curing the sweet corn are even more favorable than they are in Connecticut, where most of the sweet-corn seed is produced. It is believed also that large size in sweet corn is not altogether incompatible with a fair degree of earliness. The Stabler Early is cited as a variety which grows 8 to 9 ft. high and is ready to eat wthin 90 days from planting.

The 1904 corn pack (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, No. 8, Sup., p. 65*).—On the authority of the *American Grocer* it is stated that the corn

pack of 1904 reached 11,462,699 cases, as compared with 4,851,146 cases put out in 1903.

The 1904 tomato pack (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, No. 8, Sup., p. 65*).—The figures here given are taken from the *American Grocer* of December 21, 1904, from which it appears that the tomato pack during the season amounted to 8,968,803 cases of 2 doz. cans each, as against 10,679,809 cases for the preceding year. This is a decrease of about 16 per cent for the year 1904. The States of largest production continue to be in the order named—Maryland, Indiana, New Jersey, California, Delaware, etc. The total pack of 1904 is also compared with the pack for the preceding 7 years.

A summer's experience in growing pickles, H. H. ALBERTSON (*Cornell Countryman, 2 (1904), No. 2, pp. 26, 27, fig. 1*).—An account is given of growing $2\frac{1}{2}$ acres of cucumbers for a pickling factory. From this area 18 tons of salable cucumbers were obtained under unfavorable conditions. These sold for \$15 per ton. The expense of picking and delivering was placed at \$5 per ton, leaving a profit of \$180 for the $2\frac{1}{2}$ acres, from which the cost of planting and cultivating must be deducted.

Vegetables and their cultivation, T. W. SANDERS (*London: W. H. and L. Collingridge, 1904, pp. 494*).—Popular directions are contained in this work for the cultivation of vegetables in Great Britain.

The fruit and vegetable industries, W. H. CLARKE (*Agr. Gaz. New South Wales, 15 (1904), No. 12, pp. 1183–1204, figs. 32*).—An extended popular account of the fruit and vegetable industries about Sydney.

The cost of peaches, tomatoes, and beans in cans, C. E. PHILLIPS (*Texas Farm and Ranch, 23 (1904), No. 52, pp. 10, 11*).—Data are given on the cost of putting up peaches, tomatoes, and beans on a small scale. It is believed that these products can usually be more profitably canned than sold before canning.

Tent-grown berries and celery, F. W. CARD (*Amer. Cult., 67 (1905), No. 1, p. 2, figs. 2*).—An account is given of growing strawberries and celery under cheese-cloth tents. The weather was unfavorable for the test, there being considerable rain and cloudiness which caused a large amount of rot in all the strawberries. Even out of doors there was too little sunshine for strawberries, and the results of the tent shade were unfavorable for this crop.

In the case of the celery the tent was divided into two sections, one of which was entirely closed, while the other was left open on the north and east sides. "The celery from the open tent averaged 25 per cent taller than that grown in the open ground, and that from the closed tent averaged 40 per cent taller. The celery from the closed tent was better in other ways; not only were the stalks longer, but the color was better, being more nearly blanched, and there was less waste material in the shape of roots and leaves. Plants outside of the tents suffered much more from early frost than did those inside.

"The flavor of the celery from the closed tents was much superior to that outside. That from the open tent seemed to differ but little from that grown outside. In the matter of tenderness very little difference was to be observed."

Report of the fruit expert, W. J. ALLEN (*Agr. Gaz. New South Wales, 15 (1904), No. 11, pp. 1035–1042*).—An account is given of the work done at the experimental orchards and the yields obtained in some cases in 1904.

An experiment is cited in which 2 trees of a number of different fruits were pruned every week from the time the leaves began to fall until the buds were commencing to burst in the spring to determine the effect, if any, on the retardation of the date of blooming. There was no perceptible influence as a result of the pruning in either checking or advancing the date of blossoming. In another experiment the average diameter of 7 varieties of apples from unpruned trees was 1.5 in., while from pruned trees alongside the average diameter was 3 in.

In other experiments bitter rot was found to be less prevalent on unpruned trees, which on that account had lost a large number of their leaves. It is believed that the additional sunlight thus secured served to prevent, in a measure, the development of the disease. Pruning to secure light will, therefore, be a feature of future work in controlling this disease.

The chemical composition of apples and cider, W. B. ALWOOD, R. J. DAVIDSON, and W. A. P. MONCURE (*U. S. Dept. Agr., Bureau of Chemistry Bul. 88, pp. 46*).—This bulletin is composed of two parts: The composition of apples in relation to cider and vinegar production, already noted from a bulletin of the Virginia Station (E. S. R., 16, p. 368), and the composition of cider as determined by dominant fermentation with pure yeasts.

In the latter work a number of 50-gallon casks of cider were fermented by the addition of pure yeasts. It is stated that heating musts to control bacterial fermentation causes such changes in the flavor of the cider, even when pure yeasts are used in addition, as to make this method undesirable. "Control or dominant fermentation is easily secured if one sows a sufficient amount of fresh culture of a strong yeast into the newly made must."

In the first experiment two casks of must from the same original source were used. One cask was inoculated with about a pint of pure yeast culture originally isolated from French Sauterne wines, while the other cask was sown with the same amount of yeast originally isolated from Valée d'Auge cider from Normandy, France. Daily examinations of the must were made to determine the organisms present, and when the first fermentation had subsided the must was racked according to the French method. After the second fermentation the liquor was bottled. With both casks an excellent quality of cider was produced, but there was a marked difference in the character of the two, due to the use of yeasts of different origin.

In the next experiment a larger number of casks were used, and dominant fermentation brought about by the use of a number of yeasts of different origin. Details are given in tabular form as to the specific gravity and chemical analyses of the musts at different stages of fermentation, all of which go to show that dominant fermentation can be secured by the addition of pure yeasts to musts, and that ciders of decidedly different characters can thus be obtained.

In this experiment the cider was not racked until the end of the second fermentation or when nearly all of the sugar had been exhausted. This is the usual German method, and is not regarded by the authorities to produce as fine a quality of cider for American consumers as by the French method of racking immediately after the first fermentation, or when only about half of the sugar has been converted into alcohol.

Cider, B. C. ASTON ET AL. (*New Zealand Dept. Agr. Rpt. 1904, pp. 291–293*).—Chemical analyses of 15 samples of cider made from as many different varieties of apples are given with a general discussion of cider making.

The pollination of the Kieffer pear, G. H. POWELL (*Amer. Agr., 74 (1904), No. 27, p. 605*).—The author states that the Kieffer pear may be self-fertile, partially fertile, or completely self-sterile in different locations. In many Kieffer orchards of 3,000 to 10,000 trees the fruitfulness of the interior is persistently unsatisfactory. In a season of heavy bloom it is estimated that if only two blossoms in a hundred bear fruit, the branches would be bent to the ground. So that if bees have access to only 5 per cent or less of the blossoms, a heavy crop is insured.

One season about 600 pollinations of Kieffer with Kieffer pollen was made. In some cases the pollen was taken from blossoms from the tree on which the pollinations were made, and in other cases the pollen was obtained from Kieffer trees in different parts of the State. Only 4 per cent of the crosses with Kieffer pollen started to grow, and the fruit dropped before they were a quarter developed. The few pears that did develop were much smaller and weaker than Kieffers which had been cross-fertilized,

and were also characterized by a long, slender form, the seed end being narrow and undeveloped.

Pollen taken from Kieffer trees 50 miles distant were no more effective than pollen from the same tree. The difference in the degree of self-fertility was noted in different orchards, where in some places no self-fertilized pears developed, and in one case more than half of the total number of self-fertilized pears grew on a tree at Newark.

For practical purposes, therefore, it is believed that the Kieffer should usually be looked upon as a variety that is improved by a pollenizer. There seems to be no ideal pollenizer for the Kieffer at present. The Garber is frequently used, but not enough is yet known about this variety to feel sure of its bearing tendencies. The Le Conte is subject to rot at the core, while Manning, Duchess, Howell, and Bartlett blight badly.

A pollenizer which equals the Kieffer in vigor, fruitfulness, and beauty and far surpasses it in quality is wanted.

The classification of plums, F. Cranefield (*Ann. Rpt. Wisconsin State Hort. Soc., 34 (1904), pp. 145–153*).—A pomological classification is given of our cultivated plums, including the European and Asiatic sorts and the native American plums. A list is given of 40 well-known varieties of native plums, showing the species to which each belongs and the source of origin whether from the wild or under cultivation.

It is stated that at least 90 per cent of the seedlings of any given variety of plum will fruit earlier than the parent. The best varieties produce the best seedlings. "Certain varieties, as the Quaker, produce seedlings varying but little from the seed parent, while others, as the Wildgoose, break easily into a multitude of types."

Chemical composition of some tropical fruits and their products, E. M. Chace, L. M. Tolman, and L. S. Munson (*U. S. Dept. Agr., Bureau of Chemistry Bul. 87, pp. 38*).—The authors report special studies of Cuban fruits, and fresh and preserved pineapple. The Cuban fruits examined included oranges, grapefruit or pomelos, limes, fresh and preserved, sweet lemons, tamarinds, fresh and preserved, guava and guava preserves, bananas, mangoes and mango preserves, anonas, fresh and preserved, sapotas, fresh and preserved, mamey, fresh and preserved, hicaco, cashew (Marañon), and star apple (Caimito).

In addition to the usual data, ash analyses of these fruits and of pineapples were also determined. Attention is called to the fact that the ash of but few of the fruits is characteristic. "The citrus fruits contain somewhat large amounts of lime and iron. . . . The ash of the tamarind contains an extremely large amount of silica, of which not quite 3 per cent is sand. Banana ashes are low in lime and magnesia and high in chlorin. . . .

"It is difficult to explain such results, inasmuch as the analyst worked upon the flesh alone and employed the usual methods of obtaining the ash. In order to ascertain the quantity of chlorin lost during the combustion of the pulp, two samples were ignited with sodium carbonate, the chlorin determined and calculated back to the ash. It was found that if all the chlorin occurring in the pulp could be obtained in the ash it would amount to only 16 per cent. Naturally a somewhat lower result was obtained by the writer using ordinary methods of combustion, but amounts of chlorin 10 per cent greater have been reported by another analyst.[a]

"The ashes of the mangoes and the anonæ show nothing characteristic; those of the mamey, sapota, and hicaco contain large amounts of chlorin, twice as much as any of the other samples, although the caimito also contains a large amount of this constituent. The pineapple ash shows no marked amount of any constituent by which it could be identified, though it contains more than the average amount of potash.

[a] California Sta. Rpt. 1892–3, p. 277.

In short, there is little about the ash of the fruits examined which would aid in identifying them."

The studies of fresh and canned pineapple were undertaken to secure data regarding the composition of fruits from various sources and to secure data for establishing a basis of classification of imported pineapples for the guidance of the Government appraisers, the point of special interest being to determine whether or not sugar has been added during the process of preserving. The maximum amount of sucrose found in fresh pineapples was 10.48 per cent. The authors point out that the normal sugar content being high the mere presence of this substance in canned pineapple would be no evidence whatever of its artificial addition.

"It is further evident that if a sirup containing practically the same quantity of sugar as the natural sirup of the pineapple were added it would be quite impossible, by a mere determination of the sugar present, to detect the addition. The only guide in this case would be to determine the relation of the sugar present to the total insoluble matters of the pineapple. If, on the other hand, a sirup rich in sugar were added in preserving, it would be easily detected by the increase in the percentage of sugar in the contents of the can."

A study of the data presented "fails to bear out the common supposition that the pineapples grown upon or near the equator contain more sugar than those grown at some distance farther north, and, in fact, the normal content of sugar in pineapples grown in Florida differs so little from that of pineapples grown at Singapore that the difference is practically negligible."

The culture of the date palm (*West Indian Bul., 5 (1904), No. 2, pp. 139–149*).—This is an account of the recent introduction of the date palm into a number of the islands of the West Indies, with notes on its diseases.

The banana plant; how it grows, T. F. TEVERSHAM (*Jour. Jamaica Agr. Soc., 8 (1904), No. 12, pp. 486–490*).—A lecture on this subject, in which the author states that in examining a series of 4 suckers aged 2, 4, 6, and 7 months, respectively, only in the 7-months' sucker was any sign of the growing point of the stem seen. It would appear, therefore, that the bunch does not begin to form until the sucker is between 6 and 7 months old.

Soon after this period the plant fixes the number of hands to the bunch that it is capable of producing. "After this number has been fixed it can never be increased by later treatment." For the purpose of securing a large number of hands, therefore, it is desirable that thorough cultivation take place some time before this. After the number of hands has been determined upon by the plant cultivation will increase the size of the fruits but not add to the number of hands produced.

The banana in Hawaii, J. E. HIGGINS (*Hawaii Sta. Bul. 7, pp. 53, pls. 9, figs. 9*).—Complete directions are given for the culture of bananas in Hawaii. An account of the diseases and insects affecting bananas, the uses of bananas, etc., and descriptions of the varieties of bananas most commonly grown in Hawaii are also given.

The cultivation of pineapples in Hawaii, J. KIDWELL (*Hawaiian Forester and Agr., 1 (1904), No. 12, pp. 334–345*).—An account is given of the culture and canning of pineapples in Hawaii. Such matters are discussed as varieties, soil and fertilizers, insect pests and their remedies, planting, cultivation, and commercial canning. In the canning of pineapples especial attention is called to the necessity of not boiling the fruit more than 14 minutes. Any excess of boiling over this period greatly injures the quality.

The winter storage of nursery stock (*Nat. Nurseryman, 13 (1905), No. 1, pp. 11, 12*).—The opinions of 14 different nursery growers are given as to the best method of storing nursery stock over winter.

The preservation of fruit, apples and pears, in cellars, TRUELLE, PLUCHET, and TEISSERENC DE BORT (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 9, pp. 755–769*).—Largely a review of the literature on this subject.

Guide to hardy fruits and ornamentals, T. J. Dwyer (*Cornwall, N. Y.: T. J. Dwyer & Son, 1903, pp. 125, figs. 60*).—Popular directions are given for the culture of the usual fruits, ornamentals, and vegetables grown in the Northern States, with descriptive notes in many instances on different varieties.

Training and pruning fruit trees and vines, C. A. Keffer (*Tennessee Sta. Bul., Vol. XVII, No. 3, pp. 51–68, figs. 25*).—Popular directions, based largely on experiments at the station, are given for the pruning and training of peaches, apples, pears, plums, cherries, quinces, and grapes. The numerous illustrations included serve to supplement the text and indicate the correct methods of pruning at different stages of growth.

Budding and grafting, W. J. Allen (*Agr. Gaz. New South Wales, 15 (1904), No. 12, pp. 1171–1182, figs. 19*).—An illustrated account is given of this subject, including the results of a trial of the new method of budding originated by Mr. J. Bell (E. S. R., 16, page 157). On thin-barked trees the use of an awl-like tool for raising the bark for the purpose of inserting a scion carrying two or three buds proved unsatisfactory, as the bark split too readily. It is believed, however, that this method of grafting may be well adapted to trees with thick bark, such as the peach.

Graft hybrids, W. H. Clarke (*Gard. Chron., 3. ser., 36 (1904), No. 939, pp. 450, 451*).—A general discussion is given of the reciprocal influence of stock upon scion, with results of some observations.

A Minchull Crab tree was top-grafted with Tom Putt and Blenheim Pippin apples. The scions grew vigorously, and the fruit produced was much larger and deeper colored than the fruit of either Tom Putt or Blenheim Pippin grown on neighboring trees, while the quantity was very poor and scarcely worth gathering. Another instance is cited in which Morgan Sweet was used as a stock on which to top-graft Blenheim Pippin, as a result of which the fruit of Blenheim Pippin ripened from one month to six weeks earlier than the normal season of Blenheim Pippin.

Practical results with resistant vines in France, F. T. Swett (*California Fruit Grower, 30 (1904), No. 866, p. 1*).—This article consists of a reprint of a letter from F. T. Bioletti (now of the California station), written from Montpellier, France, and dealing with the results which have been obtained in that country by the use of resistant vines.

At the present time Rupestris du Lot is reported as being more extensively planted than any other stock and generally gives satisfaction, except in very calcareous or shallow soils. Many growers, however, are beginning to realize that even better results can be obtained in most cases by the use of Riparia × Rupestris and Vinifera-Rupestris hybrids. There is a tendency among the more progressive growers to use them to the exclusion of any varieties of pure Riparia or Rupestris.

Other hybrids which growers are beginning to use extensively are the Berlandieri crosses with Riparia and Vinifera. "It is found almost invariably that any hybrid with the necessary resistance to phylloxera and with the facility for rooting and grafting has a much greater range of adaptability to various soil and climatic conditions than the pure species." An instance is cited of a commercial vineyard in which some of the stocks mentioned above are used, and likewise a number of ungrafted stocks of Lenoir. The Lenoir portion of this vineyard is now 15 years old and produces only about one-third as much wine as the other varieties. This point is believed to be especially interesting to Californians who are planting largely of the Lenoir variety.

Varieties which it is believed are most certain to succeed under different conditions are stated by Professor Bioletti to be as follows: "*For moist, rich, mellow, deep soils*—Mourvedre × Rupestris 1202, Riparia × Rupestris 3306, Aramon × Rupestris No. 2. (This is better than No. 1 in all but calcareous soils.) *For wet soils*—Riparia × Solonis Nos. 1615, 1616, Solonis × (Cordifolia × Rupestris) 202^4. *For dry soils*—Riparia × Berlandieri 157^{11}, 420, 33, Chasselas × Berlandieri 41B. *For particularly stiff clay soils*—the Cordifolia hybrids Nos. 106^8 and 125^1."

FORESTRY.

The planting and care of shade trees, H. S. Reed (*Missouri Sta. Circ. of Information 17, pp. 16, figs. 7*).—This publication, which is reprinted from the Annual Report of the Missouri State Horticultural Society for 1903, is designed to give information on the proper method of planting and caring for shade trees on streets and lawns. Suggestions are given as to the choice of species for planting in different situations, and directions for planting and subsequent care of trees. Particular attention is given to the subject of pruning, and specific directions are given for the pruning of different species of street trees.

The forester's dictionary (*Des holzhändlers forstliches Wörterbuch. Bunzlau: L. Fernbach, 1903, pp. 95, figs. 37*).—This is an encyclopedic dictionary for the use of lumbermen, foresters, and others interested in allied industries.

The rôle of light in forests, A. Cieslar (*Mitt. Forstl. Versuchsw. Oesterr., 1904, No. 30, pp. 105, figs. 4*).—In order to show the significance of thinning in forestry and its relation to light, the author gives the results of a prolonged series of observations on the rôle of light in forest growth. In a preliminary chapter the growth of 3 to 7-year-old seedlings of white pine, larch, fir, and hemlock, both with a leaf litter and within a dense mat of grass, is shown.

After describing in detail the various forest plats which were under observation for 10 or more years, the author discusses the effect of the intensity of light on the stand, as well as upon the mass production of the forest. The plant associations as influenced by light are described in detail, after which the observations so far as they have an application to the reproduction and growth of forests are summarized.

The influence of forests on water level in mountainous regions, Ototzky (*Ann. Sci. Agron., 2. ser., 1904, II, No. 1, pp. 48-62*).—This is a controversial article, in which the author gives the results of his observations as well as a review of literature relating to the influence of forests on the water level in mountainous regions.

It is usually claimed that ground water is influenced by any factor that checks the run-off, and on this account it is often held that forests, by holding back flood waters, cause a rise in the water level. While this may be true in plains or fairly level regions, the author believes that in mountainous regions forests have under these conditions but little influence on underground waters. In general it is claimed that throughout the year the average water level is lower within the forest than in the open field. The author concludes that the influence of forests in mountainous regions on subterranean water is still an open question.

Operations of the forest reserves (*Tradesman, 52 (1904), No. 5, pp. 72, 73*).—An account is given of the attempts made by the Government in controlling and protecting the forest reserves of the country, which now include 57,833,974 acres, exclusive of the reserves in Alaska. These reserves are distributed among 13 States and Territories, and as means for the conservation of water they are believed to be of great service. The work of the Bureau of Forestry of this Department in investigating these reserves is briefly outlined.

Canadian forests and forestry, A. H. Unwin (*Jour. Soc. Arts, 52 (1904), No. 2697, pp. 721-725*).—A description is given of the forests of Canada, which are said to extend from Labrador to the mouth of the Mackenzie River, and also of the forest areas of British Columbia and western Alberta. Of the trees growing in this region the most valuable are said to be the white pine, white spruce, and Douglas fir. The distribution of these and other valuable species of trees is indicated, and notes given on the hard-wood or deciduous trees.

Notes are given on the various regulations which have been adopted from time to time regarding the cutting of timber, and suggestions offered for maintaining the crop at a maximum production. The suggestions offered include adequate protection

to existing forest areas from fires, conservative cutting, with due regard to the future of the forest, definite classification of lands into agricultural and forest lands, and various schemes for the management of existing forest reserves.

Forestry in the Transvaal, D. E. HUTCHINS (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 10, p. 927*).—It is stated that there are 454 varieties of trees suitable for experimental cultivation for timber purposes in the Transvaal, not including those which have only an ornamental value.

The author recommends an appropriation for forest planting in addition to whatever income may accrue from the conservation of the present forests. The cost of planting is estimated at about $60 per acre if stocked with nursery plants, or from $30 to $40 per acre if seed sown. The average value of planted forest at 50 years will be in the neighborhood of $1,800 per acre.

The adaptation of land for afforestation, A. C. FORBES and W. R. FISHER (*London: Laughton & Co., Ltd., 1904, pp. 104, figs. 10*).—This publication consists of two essays for which prizes were awarded by the Worshipful Company of Carpenters, the subject being the adaptation of land which has either gone out of cultivation or which has only a very low rentable value for afforestation, showing the method of procedure from taking the land over and for twenty years thereafter, and statistics as to what return may be looked for from this period to maturity.

The first essay, by Mr. Forbes, treats of the class of land adapted for planting, situation and soil, extent to which planting can be profitably carried, and cost of production and yields of timber per acre. It is said that the class of land best adapted for planting is that which, owing to surface sterility, can not be profitably cultivated and is not of paramount importance to the grazer, but which has a sufficiently deep subsoil to produce timber of greater net value than the rent derived from grazing.

The annual agricultural value of such land does not average much more than 60 cts. per acre. Its location should be below 1,000 to 1,200 ft. elevation, and within 10 to 20 miles of a good market. The planting should be made in blocks of sufficient size to allow economical fencing, cultivation, supervision, and management. The cost of producing a crop of timber on lands similar to those described will involve an initial expenditure of about $40 per acre. The average annual net returns may be estimated at from $2.50 to $4.00 per acre, allowing for nonproductive lands and calculated on the basis of present prices for timber, labor, and materials.

In the second essay Mr. Fisher shows the imports of timber into the United Kingdom, gives a description of the general character of present woodlands, distinguishing between those which are stocked with indigenous trees and those planted with introduced species, and discusses the different systems under which woodlands may be advantageously managed. He then takes up the classes of land which are unremunerative under agriculture, and describes the modes of treatment to be adopted in stocking lands, giving an estimate of the probable financial results. The net income under proper management is placed at about 3½ per cent.

Afforestation of catchment areas (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 8, pp. 468-472*).—An account is given of the attempts being made in the afforestation of the catchment areas about water supplies of numerous cities in Great Britain. These catchment areas have been secured by the local authorities in various ways, and tables are given showing the location, extent of the land, character of the soil, and the proportion which is now forested. Where possible attempts are being made to increase the growth of forest trees over these areas.

Reforestation in Italy, NEVILLE-ROLFE (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 838, 839*).—In a British consular report the author states that in 1877 about 4,000,000 acres of forest was withdrawn from the operation of the forest laws in Italy, as well as about 1,000,000 acres in Sicily and Sardinia. As a consequence of this

withdrawal there has been a reckless destruction of forests, and it is now generally recognized that the State must take active measures to preserve the forest still remaining as well as to aid in replanting.

The different uses and demands for timber are described. The author believes that special efforts should be made for reforesting the cork oak forests, as the area of this species of oak seems to be diminishing much more rapidly than the supply is increasing elsewhere.

The organization of forest investigations in Java, M. Büsgen (*Tropenpflanzer, 8 (1904), No. 10, pp. 535–540*).—A brief account is given of the organization, personnel, and methods of forest investigations in Java.

Eighteen years' practical experience in osier culture, E. Kern (*Achtzehnjährige praktische Erfahrungen im rationellen Korbweidenbau und Bandstockbetriebe. Dresden: E. Pierson, 1904, pp. VIII+275, figs. 9*).—A description is given of the soils best adapted to osier culture, their preparation for planting, varieties of willows and their respective uses, and the insect and fungus enemies of the growing plants. Chapters are devoted to cultivation, fertilizing, harvesting, marketing, etc , and an account is also given of certain steam implements adapted to use on extensive plantations.

In an appendix notes are given on the Canadian poplar (*Populus deltoides*), in which its value for planting is shown.

Mahogany and other fancy woods available for constructive and decorative purposes, F. Tiffany (*Jour. Soc. Arts, 52 (1904), No. 2675, pp. 310–320*).—After noting the peculiar adaptability of mahogany for constructive and decorative purposes, the author describes the character of the wood, its supplies and substitutes. In addition, notes are given on a large number of other species of timber which are adapted to particular uses, many of which are mentioned.

The pineries of the Commune of Libin, A. Dubois (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 9, pp. 353–369*).—A description is given of the pineries in the Luxembourg region of Belgium, the principal species being the Scotch pine (*Pinus sylvestris*). These forests have all been planted, the older ones being 20 years of age, and the younger ones from 1 to 10 years. A description is given of the different regions, the cultural operations, and general condition. The system of management is described, the pines being grown with mixtures of spruce and beech. In addition to the Scotch pine a number of other species are grown.

Use and abuse of red gum, M. Sondheimer (*Tradesman, 52 (1904), No. 5, p. 74*).—The red gum (*Liquidambar styraciflua*), which is rapidly coming into extensive use, is described, and the author states that many of the objections to this timber can be removed by its proper handling during seasoning. If properly handled it is said to be well adapted to interior finishing, and for this purpose its use is gradually increasing. In Europe, where the wood seems to be more highly appreciated than in this country, it is in demand and is extensively used under the name of "satin walnut."

The consumption and supply of soft wood in New South Wales, R. D. Hay (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 837, 838*).—According to figures presented, the importation of lumber from coniferous trees into New South Wales during the years 1902 and 1903 amounted to 57,591,070 ft. B. M. from New Zealand, 5,540,249 ft. from Canada, and 68,447,629 ft. from the United States. These large importations indicate that the quality and amount of soft wood in New South Wales are not adequate to the demand, and the author has estimated that the amount annually imported would represent the product of about 100,000 acres of soft-wood forest. There are said to be large areas which are adapted to growing species of pine that the author believes should be planted in order to supply the future demand. Among the species recommended for planting are *Pinus halepensis*, *P. laricio austriaca*, *P. pinaster*, and *P. pinea*.

Notes on wood preserving, J. S. THOMPSON (*Amer. Inventor, 12 (1904), No. 22, pp. 476, 477*).—A discussion is given of the theory of wood preserving. The method of treatment of timber is largely determined by the use to which the timber is put. Most processes in preserving timber may be classed under two groups, those depending on the injection of solutions of metallic salts and those relying on the hydrocarbon oils.

For the first the salts of mercury, copper, and zinc have been most extensively used. While the salts of all three metals protect timber against both animal and vegetable attacks, they are subject to the disadvantage of being soluble in water, and treated timber which is subject to the action of or immersed in water will after a time have the protective salts removed. In order to overcome this difficulty it has been proposed to render the salt insoluble by electrolysis, or to inject a second salt, which would form an insoluble compound with the other metal.

The second method of treatment depends on the injection of hydrocarbon oils, and for this purpose those obtained from the distillation of wood, coal, or petroleum have given the best results. Of the coal-tar products, creosote is preferred, and its action is held by different authorities to be due to different properties. By some, naphthalene, which occurs in the creosote, is claimed to be the preservative agent, acting by filling the pores of the wood and by repelling attacks of animals by its strong odor. Timbers examined after from 14 to 23 years of exposure have been found to retain little or no naphthalene.

Others consider the preservative action due to the phenolic bodies present in creosote oil, but these can not be found present after 15 years' exposure. The third class of bodies present in creosote are of an alkaloidal nature, the best known of which is acridene. These bodies are claimed by a number of investigators to have strong antiseptic properties, and although present to the extent of only about 2 per cent in ordinary creosote, their presence in treated timber can be detected after 29 years' exposure.

Based upon these conclusions, the author believes it possible to formulate an ideal process for the preservation of timber, which would consist of careful seasoning and then impregnating with a mixture of some solid hydrocarbons and alkaloidal bodies, dissolved in some of the more volatile hydrocarbons.

Railroads and the cross-tie question (*Tradesman, 52 (1904), No. 5, p. 74*).—An account is given of the experiments being carried on by the Santa Fe Railway for the testing and preserving of railroad ties. Stations have been located by the railway in Texas, New Mexico, and Arizona, where ties are chemically treated with preservatives. The experiments so far have been carried out along lines of cheap and efficient methods of creosoting the ties, but up to the present time no practical method has been discovered.

At present the treatment employed is that of injection with zinc chlorid. This treatment materially lengthens the life of the tie, which varies with the climate in which it is used. Railway ties will last from 11 to 12 years in the dry atmosphere of New Mexico, while in portions of Texas where there is a heavy rainfall the usefulness of a tie is ended in 4 or 5 years.

In Texas the principal source of railway ties is the Texas pine, while on the Pacific coast and eastward for some distance Oregon fir is most extensively used.

Experiments are being carried on with a form of plate to protect the tie against abrasion by the rail, and one made of hard wood grown in Australia has so far proved very satisfactory. It has been found cheaper than the iron plates in use on many railways and is almost as serviceable.

DISEASES OF PLANTS.

Chlorosis of plants and methods of combating it, A. DEMENTJEW (*Ann. Sci. Agron., 2. ser., 1904, II, No. 1, pp. 63-81*).—The author reviews the various theories regarding the cause of chlorosis in plants and methods for preventing the disease, after which he gives the results of his own observations regarding it. In general he believes that chlorosis is due to injuries of the roots of plants, and that perhaps in most cases root lice are the most important agents in causing the disease.

For combating chlorosis anything that will destroy the root lice may be recommended, although in the absence of more definite information the author does not give suggestions regarding its control.

Plant pests, T. W. KIRK (*New Zealand Dept. Agr. Rpt. 1904, pp. 296-309, pls. 2*).—Accounts are given of rose rust, grain smuts, and oat rusts, with suggestions for their prevention, and a brief account is given of fruit flies by T. Broun.

Plant diseases in Bohemia, F. BUBÁK (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 10, pp. 731-741*).—Notes are given of the fungus diseases and insect enemies observed on plants of economic importance during 1902. A tabulation is given showing that these pests were most abundant in May, June, and October, nearly three-fourths being observed during these months.

Diseases of economic plants in the Tropics, G. DELACROIX (*Agr. Prat. Pays Chauds, 4 (1904), No. 20, pp. 201-225, figs. 3*).—A general account is given of the character of plant diseases, the author classifying them into those which are due to wounds, atmospheric or other conditions, and those caused by parasites. A description is given of a number of the more common diseases of the first class.

A prodromus of cryptogamic diseases in Belgium, H. VANDERYST (*Bul. Agr. [Brussels], 20 (1904), No. 5, pp. 858-944, figs. 17*).—This is a preliminary account of some of the plant diseases observed in Belgium, the present paper dealing with the Peronosporineæ. About 52 species are technically described, together with their distribution in Belgium and their host plants, and so far as known methods of prevention are given.

An internal infection germ of cereal smuts, L. HECKE (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 2, pp. 59-64*).—A preliminary report is given of investigations by the author which have led him to doubt the claim frequently made that smut infection of cereals takes place only at the time of the germination of the seed or immediately subsequent thereto.

Pot experiments are described in which spores of *Ustilago hordei* were placed on the pistils of barley flowers. All the care practiced in artificial pollination was followed, and the plants grown to maturity. When harvested there was no trace of smut on the seeds, all of which were sown. The plants from these seeds when harvested gave from 16 to 30.7 per cent infested heads.

From this the author argues that there are some internal means of infection by smuts, and that soaking seed in copper sulphate or other fungicides will not protect against this method of infection.

Potato diseases and their treatment, F. C. STEWART and H. J. EUSTACE (*U. S. Dept. Agr., Office of Experiment Stations, Farmers' Inst. Lecture 2, pp. 30*).—This is a syllabus of a lecture on potato diseases and their treatment. The lecture is designed to be accompanied by 47 views illustrating the method of controlling potato diseases. The information is drawn largely from experiment station investigations, and a considerable bibliography of the subject is appended to the bulletin. In an appendix detailed directions are given for the preparation and application of the different fungicides recommended.

"Blackleg" of potatoes, M. C. COOKE (*Gard. Chron., 3. ser., 36 (1904), No. 915, p. 28*).—An account is given of a disease of potatoes in which the lower part of the stem was blackened and the production of tubers was reduced to a few very small

specimens. On account of the blackening at or near the surface of the ground the name blackleg has been given this disease. From recent publications the author is led to believe that this disease is similar to a disease in this country attributed to *Rhizoctonia solani*.

In the specimens examined a white mold was found present which the author thinks probably was a saprophyte, but he records its occurrence and gives a description, so that future investigators may determine whether it has any relationship with the disease.

Notes on the mosaic disease of tobacco, BOUYGUES and PERREAU (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 4, pp. 309, 310*).—While investigating the mosaic disease of tobacco in 1903 the authors observed a few plants here and there that appeared free from infection among a large number of diseased ones. Thinking perhaps they had acquired some immunity, these apparently sound plants were transferred to a hotbed and kept under observation. Of over 200 such plants all became affected but about 4 per cent. From these all the flowers were removed except two buds on the healthiest and most vigorous plant. These were protected from foreign pollen and their seed saved.

In 1904 the seed was sown in a hotbed of new soil, and all fertilizers were excluded which could have become infested with the disease through tobacco leaves, stems, etc. From this bed 102 plants were selected, planted in a field, and given careful culture, and by July 19 only about 2 per cent showed any indication of disease.

This seems to indicate that partial immunity was secured during the first generation, as many of the plants remained free from disease throughout the season, although their leaves were in contact with badly infested ones. However, if the leaves became punctured in any way, the characteristic mosaic spots appeared.

The authors believe that the losses caused by the mosaic diseases of tobacco may be greatly reduced by the selection of seed from disease-resistant plants, placing the seed beds in new soil, avoiding the use of composted tobacco stems and leaves, careful cultivation to prevent injuring the plants, and the immediate removal and burning of all diseased plants whenever observed.

The breeding experiments are to be continued.

Cluster cups on anemones, G. MASSEE (*Gard. Chron., 3. ser., 36 (1904), No. 914, p. 4, fig. 1*).—A brief description is given of the cluster cups caused by *Æcidium punctatum* on anemones. The diseased plants are readily recognized by the pale curled leaves supported on long leaf stalks, which are much more erect and longer than in healthy plants. A plant once affected should be destroyed, as the mycelium passes into all parts, and after becoming infected the plants seldom or never bloom.

Cucumber and melon mold, M. C. COOKE (*Gard. Chron., 3. ser., 36 (1904), No. 923, pp. 172, 173*).—The author describes the condition of some cucumber leaves which were affected with circular spots that could not be distinguished from those caused by the fungus *Cercospora melonis*. It was claimed that the fungus had been killed by heavily fertilizing the plants with potash fertilizers. When examined the leaves of the cucumber presented the characteristic spots of the well-known cucumber mold, but no trace of the fungus could be found.

The entire absence of mycelium and other portions of the fungus led the author to believe that possibly the development of the fungus was arrested by the use of the fertilizer, as claimed. As having a bearing on the treatment of other diseases, the author records this fact, and believes the subject worthy of further investigation.

Bitter rot of apples, M. C. COOKE (*Gard. Chron., 3. ser., 36 (1904), No. 928, pp. 249-251, figs. 5*).—Notes are given of the bitter rot of apples, due to *Glœosporium fructigenum*, and the various phases of the disease are described, the author drawing extensively on Bureau of Plant Industry Bulletin 44 (E. S. R., 15, p. 270).

Collar rot or gum disease, C. FULLER (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 11, pp. 1041-1050*).—In a previous publication (E. S. R., 15, p. 52) the author

called attention to the occurrence of collar rot or gum disease of citrus trees, and enumerated some of the reputed causes of this disease.

Further investigations were contemplated and have been carried out to some extent, from which the author concludes that the disease is favored by soil conditions, too deep planting, and improper grafting, particularly when the grafts are made on rough lemon stock. These causes may be eliminated to a considerable extent by proper drainage, shallow planting, and high budding on suitable stock.

The fumagine of the olive, E. ZACHAREWICZ (*Prog. Agr. et Vit. (Éd. L'Est), 25 (1904), No. 50, pp. 686–689*).—The disease of the olive known as fumagine and its association with *Cycloconium oleaginum* are described. As usually understood the disease is an accompaniment of the scale insect *Lecanium oleæ*.

For treatment the author suggests the use of an emulsion composed of soap 1 kg., petroleum 4 liters, copper sulphate 1 kg., and water to make 100 liters. Directions for the use of this mixture are given; and based upon its successful employment an official decree has been issued requiring its use in infested regions. A great many orchardists have successfully used it, and the author believes that its more extended use would tend to greatly reduce the amount of disease.

Treatment of vines for the prevention of fumagine, L. DEGRULLY (*Prog. Agr. et Vit. (Éd. L'Est), 25 (1904), No. 51, pp. 705, 706*).—Grapevines in Algeria and some other regions have been noted as affected with fumagine, similar to the disease occurring on olives, and as in the case of that disease, it follows the attacks of various insects.

For the prevention of the disease the author recommends winter treatment in which the vines are thoroughly sprayed or washed with various mixtures, such as a lime and oil mixture, a mixture of soap, oil and naphthalene, and ordinary petroleum emulsion.

The white rot of grapes, G. FLEURY (*Rev. Vit., 22 (1904), No. 572, pp. 611, 612, pl. 1*).—A description is given of the white rot of grapes caused by the fungus *Coniothyrium diplodiella*. This disease is said to have been of American origin and has been introduced into Europe since its discovery in 1887. The disease is difficult to combat, and on this account the author recommends the thorough use of fungicides.

The destruction of grapes affected with black rot, J. CAPUS (*Rev. Vit., 22 (1904), No. 565, pp. 413, 414*).—On account of the possibility of black rot being carried by diseased mummied grapes or through the presence of the organism on the dried pomace or upon the seeds, the author recommends burning or treating with a strong solution of iron sulphate or other fungicide.

Notes on Phoma reniformis, L. TRABUT (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 21, pp. 453, 454, figs. 2*).—A note is given on the occurrence of *Phoma reniformis* on certain varieties of grapes in Algiers, the fungus causing a rotting of the grapes which is quite similar to that produced by the black rot fungus (*P. uvicola*). The two species of fungi resemble each other quite closely, except in the size of the spores and a few other particulars, which are enumerated.

The culture and development of the fungus causing grape anthracnose, P. VIALA and P. PACOTTET (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 1, pp. 88–90*).—By the methods described for the cultivation of the black-rot fungus (E. S. R., 16, p. 272) the authors have isolated the grape anthracnose fungus (*Sphaceloma ampelinum*). This fungus was formerly known only from its conidial stage, but the authors were able to recognize the perfect form, to which the name *Manginia ampelina* has been given. The various phenomena of its growth in culture media are described.

The minimum quantity of copper sulphate needed for the control of the downy mildew, N. PASSERINI (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 18, pp. 389–391*).—According to the author a 0.5 per cent solution of copper sulphate used as Bordeaux mixture is sufficient for protecting vines against Peronospora in ordinary years. In regions quite subject to the disease and under conditions favorable to the

growth of the fungus the amount of copper may be increased to ¾ or 1 per cent. As weak a solution as 0.25 may be used in dry climates or in regions relatively free from the disease.

Parasitic diseases of the vine, F. GUÉGUEN (*Les maladies parasitaires de la vigne. Paris: Octave Doin, 1904, pp. VI + 198, figs. 83*).—After describing methods for the examination of diseased vines, the author gives an account of the different plant and animal parasites to which the grape is subject. Chapters are devoted to the diseases caused by bacteria, fungi, and phenogamic parasites, as well as the various insects, mites, spiders, nematodes, snails, etc., giving suggestions for the prevention of their injuries.

Canker of trees, P. VAN BIERVLIET (*Rev. Gén. Agron.* [*Louvain*], *13* (*1904*), *No. 9, pp. 378–380*).—A brief account is given of an attack of *Nectria cinnabarina* on linden, mulberry, ash, beech, and various other trees.

A leaf fungus on Hevea braziliensis (*Agr. Bul. Straits and Federated Malay States, 3* (*1904*), *No. 8, pp. 308, 309*).—The occurrence of a leaf fungus, which is apparently related to the Uredineæ, is reported on leaves of Para rubber trees on the Malay Peninsula. The effect on the host plant is briefly described, and from its apparent serious nature the author recommends the removal of infected leaves and spraying with Bordeaux mixture.

Sulphur mixtures, E. RABATÉ (*Rev. Vit., 22* (*1904*), *No. 574, pp. 671, 672*).—On account of the extensive use of various forms of sulphur in liquid fungicides, the author has investigated their preparation and concludes that it is possible to prepare a stock mixture that can be used at any time. This is made by mixing into a thick paste lime and sublimed sulphur, and covering the mixture with sufficient water to prevent carbonization. When ready for use this can be added to a 2 per cent solution of copper sulphate, making a Bordeaux mixture with sulphur. This should be made neutral, being tested with phthalin, helianthin, or other test papers.

The sulphur when mixed with the lime is insoluble and acts in solution something like fine sand, diminishing the adherents of the copper precipitates. On this account this fungicide is less adapted to use in combating such diseases of vines as the black rot or downy mildew, but for the powdery mildew it has exceptional value.

The use of indicators for testing copper fungicides, E. RABATÉ (*Prog. Agr. et Vit.* (*Ed. L'Est*), *25* (*1904*), *No. 41, pp. 417–420*).—The author points out the advantage of the use of indicators for testing Bordeaux mixture and other solutions of copper, to determine when the mixture is neutral. For this purpose he gives the results of comparative tests of helianthin, tournesol, and phenolphthalein. Of these the author states that tournesol is a secret preparation of varying constitution, and is not to be preferred over either of the others.

For those who are not thoroughly conversant with chemical manipulations he recommends the employment of phenolphthalein when the solutions are known to be but slightly alkaline, as this will prove of easy and satisfactory use. Helianthin is a more sensitive indicator in the presence of carbonic-acid gas, which is given off by the Burgundy mixture, and is an indicator which permits of more economy in the use of basic products. This economy, which would be but slight in the case of the use of lime, is of sufficient importance to take into consideration when carbonate of soda or ammonia is used.

The efficiency of dilute Bordeaux mixture, G. B. CUCOVICH (*Bul. Agr. Algérie et Tunisie, 10* (*1904*), *No. 12, pp. 257–261*).—For three years the author has been experimenting with dilute solutions of Bordeaux mixture in which the amount of copper present has been reduced to 1 per cent or less, with the necessary lime to make the mixture.

This has been used in spraying for downy mildew of grapes, and the results show that a 1 per cent solution is sufficiently strong for all purposes, even in rainy seasons.

Where there is less rain a $\frac{3}{4}$ per cent solution is believed to be sufficient in the ordinary season, and in dry years or in regions where frequent rains are not experienced a $\frac{1}{2}$ per cent solution will be found sufficient for combating the downy mildew.

Journal of Mycology, index, W. A. KELLERMAN (*Jour. Mycol., 10 (1904), No. 74, pp. 289–392*).—This is an index to the first 10 volumes of the *Journal of Mycology*, in which the hosts and parasites are indexed and a considerable list of synonyms are given. In addition a separate index is given to Volume X.

Horticulture: Diseases and pests, E. P. FELT (*New York State Library Legislation Bul. 220, pp. 15, 16*).—A review is given of recent legislation regarding the diseases and pests of horticultural crops. A number of States have amended their laws to secure greater efficiency, and among them California, Utah, New Mexico, and Florida. Notes are given of changes in legislation regarding the insect pests in Texas, Minnesota, and California. Nursery inspection laws have been enacted by a number of States and others have amended previous laws to secure greater efficiency, the principal changes being made in California, Connecticut, West Virginia, Michigan, Montana, New Jersey, and Virginia.

ENTOMOLOGY.

The use of Paris green in controlling the cotton-boll weevil, W. D. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 211, pp. 23*).—During the past season the Bureau of Entomology has carried on a number of experiments with Paris green as a spray and in a powdered form and similar experiments have been made on a large scale by planters in various parts of Texas. It is estimated that at least 25 carloads of Paris green were used in Texas in combating the boll weevil.

The experiments reported by the author were largely confined to testing the value of Paris green when applied in the form of a dry powder. Careful estimates were made of the number of weevils present on treated plants and the effect of the application of Paris green was studied as accurately as possible. As the result of tests on a small scale, during which 732 weevils were counted on the plants which were treated, 27.12 per cent of the weevils were found alive after treatment, 32.05 per cent dead, and 40.89 per cent missing. The lightest application during these tests was at the rate of 20 lbs. per acre and it was estimated that 4 applications at this rate could not possibly be profitable.

Three tests were made on a large scale by the author and other experiments were conducted by various planters located in different parts of Texas. As a result of all of these tests of the value of Paris green, it was shown that about 30 per cent of the weevils may be killed by heavy application of the poison when the plants are small and without squares. Many instances were noted, however, where a striking failure from the use of Paris green was evident, while the efficiency of cultural methods was demonstrated.

The author concludes from his experiments, therefore, that the persistent use of Paris green, in some cases as many as 15 applications, does not materially reduce the number of weevils or increase the yield of cotton. Conclusive instances of the successful use of Paris green by planters were not observed. The reasons for the ineffectiveness of Paris green are to be found in the facts that a large percentage of the weevils do not emerge until after the formation of squares on the cotton plants and that, therefore, the weevils feed within the shelter of the bracts.

Cotton insects and fungus blights, C. FULLER (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 10, pp. 931–944, figs. 16*).—The author discussed the habits, life history, natural enemies, and means of combating cotton-boll worm, cotton worm, Mexican cotton-boll weevil, cutworms, plant lice, *Aluria crypta*, etc., as well as rust mildew, angular spot, pink spot, and cotton-boll rot.

The grape-berry moth, M. V. SLINGERLAND (*New York Cornell Sta. Bul. 223, pp. 41–60, figs. 15*).—In this country the grape-seed insect, grape curculio, and grape-berry moth may occur in grapes causing them to be wormy. The grape-berry moth, however, is usually the insect concerned in such damage. Its presence may be recognized by a purplish spot on the half-grown green berries.

According to the author's investigations this is not the European pest *Eudemis botrana*, but should be referred to *Polychrosis viteana*. The author has never observed this insect eating anything but grape blossoms, recently set fruit, the stem of grape clusters, and the green and ripening grapes of both wild and cultivated species. Apparently no varieties are exempt from attack, but in the Chautauqua district Concords are most seriously affected. Some of the moths of the first brood appear about June 1. The first brood of caterpillars do not live inside of the blossoms or berries, but feed upon the outside. The most destructive work of this pest is done by the second brood of caterpillars, which work in the green grapes in July and August. A partial third brood appears in the fall.

A considerable number of insect parasites are known to prey upon these pests, and notes are given on these species. In combating the grape-berry moth fallen leaves should be destroyed, and the soil should be cultivated in the fall to destroy the hibernating pupæ. The practice of putting paper bags around the clusters of grapes protects them from the grape-berry moth and from other insects and fungus diseases. Infested berries may be picked in August, and wormy berries discovered at the fall picking should be destroyed. It may be well to prevent the growth of sumac and other underbrush in the neighborhood of vineyards.

The grape-berry moth may be completely controlled by spraying with arsenate of lead at the rate of 10 or 12 lbs. per 100 gal. of water. The first application should be made just before the blossoms open, and the second after the petals fall, while the third application may be given when the grapes are about the size of small peas. Comparative notes are given on the American and European grape-berry moths and on species of American moths that have been mistaken for the grape-berry moth. A brief note is also given on a leaf roller (*Eulia triferana*) that sometimes works in conjunction with the grape-berry moth.

Two grape pests, M. V. SLINGERLAND and F. JOHNSON (*New York Cornell Sta. Bul. 224, pp. 61–74, figs. 5*).—The grape root-worm apparently caused less damage during the past season than in 1903. Since the adult beetle feeds upon the foliage to a considerable extent, spraying experiments were carried on in 1903 which gave encouraging results.

In 1904 such experiments were repeated and it was found that by applying arsenate of lead in water or Bordeaux mixture at 2 periods (about June 25 and July 11) the greater part of the damage from this beetle could be avoided. On 15 grapevines sprayed in this manner, 11 egg clusters were found, while 151 egg clusters were found on 15 similar vines untreated. The spraying can be performed for about \$3 per acre for each application. The authors consider it to be demonstrated that the grape root-worm may be effectively controlled by arsenical sprays and more cheaply than any other method. The beetles are not all killed by this method, however. The continued use of various devices for catching beetles by jarring from the vines has not given encouraging results, the vines being too much injured by this method.

In the study of the cause of the failure to set fruit in certain grape clusters, a grape blossom-bud gnat was found which occurred to the number of 18 in a single bud. The identity of this pest has not been established and the habits and life history have not been worked out. Since the pest occurs most abundantly in neglected vineyards, or near wood lots or hedges, thorough cultivation and clean farming are recommended for controlling it.

Brown-tail moth and other orchard moths, EDITH M. PATCH (*Maine Sta. Bul. 108, pp. 153–168, pls. 3*).—Attention is called to the fact that deserted or neglected

orchards and not well-kept orchards are the chief sources of infestation. The habits and life history of the brown-tail moth are discussed in considerable detail, with notes on its distribution in this country and the means of combating it. The most effective and economical way of controlling this pest is by collecting and burning the winter nests.

A similar discussion is also presented of the gypsy moth, tent caterpillar, fall webworm, tussock moth, promethea moth, cecropia moth, hickory tiger moth, and red-humped caterpillar. Brief notes are also given on birds which feed on orchard pests.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 6 (1904), No. 4, pp. 183–253, figs. 27*).—In this number of the proceedings various articles relating to injurious and other insects are included. The number also contains a volume index.

The articles included in this number are as follows: A list of Neuropteroid Insects, exclusive of Odonata, from the vicinity of Washington, D. C., N. Banks; Notes on the Syrphid fly *Pipiza radicum*, D. W. Coquillett; The egg and young larva of *Culex perturbans*, R. P. Currie and H. G. Dyar; Descriptions of new forms of the genus Illice, A new Tortricid from the seashore (*Ancylis maritima*), A new Phycitid from the foothills (*Laetilia fiskeella*), A few notes on the Hulst collection, H. G. Dyar; Notes on a few Aradidæ occurring north of the Mexican boundary, O. Heidemann; and Notes on North American Psyllidæ, I, E. A. Schwarz.

A disease of beetles and a general discussion of insect diseases, Bail (*Festschrift zur Feier des Siebzigsten Geburtstages des Herrn Professor Dr. Paul Ascherson. Leipzig: Borntraeger Bros., 1904, pp. 200–215*).—Numerous specimens of *Nebria brevicollis* were found affected with an epizootic disease. During the course of the disease the upper portion of the body of infected beetles was raised up so that the wings were in an unnatural position.

The author made a study of the fungus which caused the disease, and found it to be *Entomophthora radicans* or a closely related species. Brief notes are also given on *Botrytis tenella*, *Empusa aulicæ*, *Cordyceps militaris*, species of Nosema, and other fungi which cause insect diseases.

Report on the work of the section for plant protection, C. Brick (*Ber. Tät. Abt. Pflanzenschutz [Hamburg], 1903–4, pp. 35–47*).—A statistical statement is presented showing the amount of fruit and plants imported from the United States and other countries, with notes on the extent of infestation of these products with San José scale and other injurious insects. A large number of scale insects were found on fruit and plant importations, and notes are given on these species.

Some miscellaneous results of the work of the Division of Entomology (*U. S. Dept. Agr., Bureau of Entomology Bul. 38, rev. ed., pp. 110, pls. 2, figs. 9*).—This is a revised edition of a bulletin already noted (E. S. R., 14, pp. 671, 672).

Notes on the biology of certain coleoptera which in the larval condition attack wheat, M. J. Rivera (*Apuntes acerca de la biolojia de algunos coleópteros cuyas larvas atacan al trigo. Santiago de Chile: Cervantes, 1903, pp. 66*).—A detailed account is given of the life history, habits, distribution, and means of combating *Rivera plebeja* and *Phytolæma herrmanni*.

Researches on North American Acridiidæ, A. P. Morse (*Washington: Carnegie Institution of Washington, 1904, pp. 55, pls. 8, figs. 12*).—A study was made of the locust fauna of the southeastern United States for the purpose of determining the influence of climatic and other conditions upon the distribution of various species as well as other points connected with the habits and life history of locusts. Detailed notes are given on the species found during this investigation, a number of which are described as new.

Studies in the orthopterous family Phasmidæ, J. A. G. Rehn (*Proc. Acad. Nat. Sci. Philadelphia, 56 (1904), pt. 1, pp. 38–107*).—Descriptive notes are given on

a large number of genera and species of this family obtained from various countries throughout the world.

Locusts and grasshoppers, W. W. Froggatt (*Agr. Gaz. New South Wales, 15 (1904), No. 8, pp. 733–738, pl. 1*).—Notes are given on the habits, life history, and economic relations of a number of species of locusts belonging to various genera.

The pineapple scale, D. L. Van Dine (*Hawaii Sta. Press Bul. 10, pp. 6, fig. 1*).—The appearance, habits, and life history of *Diaspis bromeliæ* are briefly noted. In combating this pest of the pineapple, the use of kerosene emulsion and resin wash is recommended.

An invasion of Deilephila lineata livornica in an Algerian vineyard, A. Giard (*Bul. Soc. Ent. France, 1904, No. 13, pp. 203–206*).—Brief notes are given on an attack of this insect in a vineyard in Algeria. The outbreak was believed to be due to peculiar climatic conditions, and the literature relating to this pest is briefly reviewed.

The rosebud feather-wing, Mary E. Murtfeldt (*Canad. Ent., 36 (1904), No. 11, pp. 334, 335*).—Notes are given on *Platyptilia rhododactyla*, which is said to bore into rosebuds in the vicinity of St. Louis. The insect has been observed in that locality for 2 years and threatens to become a serious pest. Notes are given on the appearance of the insect and on its habits and life history.

Tea pest: Spread of shot-hole borer (*Year Book Planters' Assoc. Ceylon [Kandy], 1903–4, pp. IX–XX*).—Copies are given of government orders and regulations regarding the methods of combating or eradicating *Xyleborus fornicatus*.

The genus Ectopsocus and a description of a new variety of E. briggsi, C. Ribaga (*Redia, 1 (1903), No. 2, pp. 294–298*).—The author describes a new variety of this species under the name *E. briggsi meridionalis*, and notes are given on the characters of the genus and related species.

Myrmecophilous acarids, A. Berlese (*Redia, 1 (1903), No. 2, pp. 299–474, pls. 14, figs. 16*).—The literature relating to this group of mites is discussed in connection with a short bibliography. Detailed descriptions are given of a large number of species, which agree in possessing myrmecophilous habits. These species belong to a great variety of genera and families. Analytical tables are presented to assist in the identification of the species.

Notes on mites, A. Berlese (*Redia, 1 (1903), No. 2, pp. 235–280*).—Detailed descriptive notes are given on a large number of new genera and species of mites obtained from various localities.

Experiments in destroying black flies, C. M. Weed (*New Hampshire Sta. Bul. 112, pp. 131–136, figs. 4*).—The material contained in this bulletin has already been published in essentially the same form, and has been noted (E. S. R., 16, p. 70). The most common species of black fly in New Hampshire is *Simulium venustum*.

The mosquito investigation in New Jersey, J. B. Smith (*Pop. Sci. Mo., 66 (1905), No. 3, pp. 281–286, figs. 2*).—A summary is presented of the work in mosquito extermination carried on by the State of New Jersey. It has been demonstrated that among the 35 species of mosquitoes which occur in New Jersey not more than 6 are of sufficient importance to be considered in this work. The 2 most troublesome species are *Culex sollicitans* and *C. cantator*. A great amount of work has been done in ditching and draining the marshy bottoms which furnish the most important breeding places for mosquitoes.

Studies on mosquitoes of the genera Culex and Anopheles, B. Galli-Valerio and Jeanne Rochaz-De Jongh (*Atti Soc. Studi Malaria, 5 (1904), pp. 1–47, figs. 2*).—Observations were made in the field under natural conditions for the purpose of determining more accurately some of the features of the life history of mosquitoes. It was found that the larva of both Culex and Anopheles may pass the winter successfully under ice. An elaborate series of experiments was carried out for the

purpose of learning the effects of various predaceous animals and physical and chemical reagents upon mosquitoes in their different stages.

It was found that various species of water beetles, particularly of the genera Gyrinus and Dytiscus, as well as larval dragon flies, frogs, triton, etc., are of some importance in the destruction of larval mosquitoes. The authors determined by experiment that the eggs of mosquitoes possess a great resisting power toward low temperatures. Even temperatures of -12 to $-13°$ C. were successfully resisted for a number of hours. Agitation of the water or the production of currents in the water appeared to have no influence on mosquito eggs. Larvæ also proved to be able to resist a temperature of $-4°$ C., but could not withstand high temperatures, such as 40° C. It was found that in a dry condition the larvæ of mosquitoes had little resisting power toward low temperatures.

Macerated solutions of hemp and flax had no influence upon the mosquito larvæ, while an extract of the flowers of *Scorzonera humilis* had a rapid effect, and the larvæ were quickly destroyed with solutions of lysoform, petroleum, and saprol.

Mosquito larvæ appear not to be adapted for living in water which is greatly agitated by the wind, or in which strong currents are developed. They may live for months in winter without food, but at other seasons die within 7 to 12 days if not fed. An attempt was made to determine the effect of cultures of *Bacillus subtilis* on mosquito larvæ, but the results were not satisfactory. In the nymph condition mosquitoes were found to be quite resistant to low temperature but very susceptible to high temperature. In this stage mosquitoes withstood desiccation very successfully. The nymphs were less affected by most chemicals than were the larvæ, but succumbed rapidly to the action of kerosene and saprol. The further development of the nymph was not much influenced by the agitation of the water. It was found that adult mosquitoes could live for at least 21 days without food, while in winter the fasting power is even much greater. Adult mosquitoes also showed great resisting power to low temperatures.

Beekeeping, F. Sworder (*Transvaal Agr. Jour., 2 (1904), No. 8, pp. 538, 539*).—Brief notes are given on the form and size of sections most suitable for use in beehives, and on the storage of honey for the purpose of securing the proper ripening.

Review of the principal work of the sericultural station at Murcia for 1904, E. Lopez (*Resumen de los principales trabajos realizados en este establecimiento durante la campaña sedera de 1904. Murcia: Estación Sericola, 1904, pp. 23*).—Brief notes are given on the extent of the silk industry as indicated by reports received at the sericultural station at Murcia, together with an account of the work of this station in the study of silk production, distribution of silkworm eggs, etc.

Silk production in Persia in 1904, G. P. Riva (*Bol. Uffic. Min. Agr., Ind. e Com. [Rome], 6 (1904), No. 7, pp. 563, 564*).—Brief notes are given on the number of cocoons of different races of silkworms produced in Persia for the past 10 years.

FOODS—NUTRITION.

The influence of food preservatives and artificial colors on digestion and health. I, Boric acid and borax, H. W. Wiley et al. (*U. S. Dept. Agr., Bureau of Chemistry Bul. 84, pt. 1, pp. 477, fig. 1, charts 8*).—This bulletin presents a full report of the experiments with healthy young men given boric acid and borax, of which a brief summary of the principal results has been previously noted (E. S. R., 16, p. 182).

It is stated that during the whole course of observation 607.4 gm. of preservative in the form of boric acid or its equivalent in borax was given, of which 77.16 per cent was recovered in the urine. As regards food consumed in relation to body weight, little difference was observed in the different experimental periods, the total

quantity of dry matter in the daily food being in round numbers 1 per cent of the body weight.

"A careful study of the effect of the preservative administered upon the composition of the feces shows a slight tendency to increase the amount of water therein. There is, however, no tendency of any marked nature, even when the preservatives are given in large quantities, to excite diarrhea. The administration of the preservative produces but little change in the weight of dry matter in the feces."

As regards the metabolism of nitrogen, it was found that 94.5 per cent of the nitrogen consumed in the fore period was excreted, 94.1 per cent in the period with the preservative, and 90.3 per cent in the after period, the proportion in the urine being, respectively, 86, 85.5, and 81.4 per cent in the 3 periods. The effect of the preservative on the general character of the urine is considered in detail.

Though the effects of boric acid and borax on the metabolism of phosphorus gave some contradictory results, the authors state that there was a marked tendency toward an increased excretion of phosphoric acid in the period in which the preservative was administered. On an average the proportion of phosphoric acid excreted in the fore period was 97.3 per cent, in the period with the preservative 103.1 per cent, and in the after period 97 per cent.

As shown by the amounts of fat found in the feces, the preservatives tested caused almost no disturbance in the metabolism of this nutrient. According to the results obtained there was a slight tendency on the part of the preservative to interfere with the combustion of food in the body, the fact being especially noticeable in the after period. On the whole the preservatives caused "a marked decrease in the total solids in the urine and a marked increase in the total solids in the feces."

From the whole investigation the general conclusion was drawn that "both boric acid and borax, when continuously administered in small doses for a long period, or when given in large quantities for a short period, create disturbances of appetite, of digestion, and of health."

Influence of formaldehyde on the digestive enzyms, T. M. Price (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 114–121; Circ. 59, pp. 114–121*).—From artificial digestion experiments the following conclusions were drawn:

Formaldehyde added to milk in the proportion of 1:20,000 preserved the milk for 48 hours. Added to milk in the proportion of 1:2,500 or less, it has no effect on the activity of the fresh enzyms, rennet, pepsin, pancreatin, and steapsin *in vitro*. Added to starch in the proportion of 1:2,500 or less, it has no effect on the conversion of the starch by the enzyms, ptyalin, and amylopsin *in vitro*. Formaldehyde added to milk in sufficient quantity to preserve it for 48 hours, that is, 1:20,000, did not interfere with the action of the enzym galactase *in vitro*.

Formaldehyde added to milk in the proportion of 1:20,000 prevents the development of the more common bacteria found in milk, and when added in the proportion of 1:1,560 it kills these bacteria. Formaldehyde may be added to milk in sufficient quantities to preserve the milk and prevent the development of some of the more common bacteria, that is, 1:10,000, and still have no deleterious effect on the digestibility of the milk *in vitro*.

Physiological economy in nutrition, R. H. Chittenden (*New York: Frederick A. Stokes Co., 1904, pp. XIV+478, pls. 16*).—The important investigations recorded in this volume extended over the better part of the year, and were made with different groups of men in normal health, including professional men, soldiers, and student athletes.

The special object was to secure data regarding the actual food requirements of the body, and the possibility of maintaining health and vigor on rations containing smaller amounts than the commonly accepted dietary standards call for. The general plan of the studies was to gradually replace the ordinary diet with a simple mixed diet containing a comparatively small amount of protein. To accomplish this

and at the same time provide a diet adequate in bulk and energy it was found convenient to materially diminish the amount of animal food, though the author explicitly states that it was not his object to provide a vegetarian diet.

Throughout the investigation careful records were kept of the foods consumed, and at intervals the balance of income and outgo of nitrogen was ascertained, the necessary analyses being made. In the case of urine the specific gravity, uric acid, and phosphoric acid were also determined. Apparently the energy value of the foods was calculated. In the case of the soldiers and athletes careful records were kept of the physiological condition of the men. A study of the reaction-time and other psychological data was also carried on with the students, and in connection with the investigation morphological studies of the blood were also made.

The author was himself the subject of the first of the investigations reported. When the change of diet was made the body weight diminished somewhat, then became fairly constant, and for 9 months the author found that he was able to maintain a body weight of 57 kg. with a diet furnishing in round numbers 40 gm. of protein (6.4 gm. nitrogen) and 2,000 calories of energy per day. He states that his general health and well-being were normal or above. Similar results were obtained with 4 other professional men.

Considering the group of professional men as a whole, the author believes that the so-called "minimal proteid requirement of the healthy man—which for this group of individuals we may place at the low level of 0.093 to 0.130 gm. of nitrogen per kilo of body weight—represents the real physiological needs of the system for nitrogen, and in so far as our present data show, anything beyond this quantity may be considered as an excess over and above what is required for the actual physiological necessities of the body. Naturally, however, there may be nothing detrimental in a slight excess of proteid beyond the daily needs."

The studies with soldiers were carried on with 13 men, especially detailed for the purpose, and extended from October to April. The men were busily engaged with gymnasium work, military drill, and some routine duties connected with the experiments. Soon after the change in ration the body weight became fairly constant, on an average, and no great difficulty was experienced, according to the author, in maintaining a condition of nitrogen equilibrium. The men were able to adjust themselves to the lower protein ration, and lived for 5 consecutive months "with a proteid metabolism corresponding to 7 to 8 gm. of nitrogen per day, with maintenance of body weight and without discomfort or loss of bodily vigor." The corresponding energy value of the diet was placed at 2,500 to 2,600 calories.

A similar investigation extending over 5 months was made with 8 university students trained in athletics. "As the results show, all these men reduced their rate of proteid metabolism in such degree that the amount of nitrogen excreted daily during the period of the experiment averaged 8.8 gm., implying a metabolism of about 55 gm. of proteid matter per day. In other words, these athletes were able to reduce their nitrogenous metabolism to as low a level as many of the men of the professional group and of the soldier group, and this with not only maintenance of health and strength, but with a decided increase in their muscular power. Metabolized nitrogen per kilo of body weight for all these men, with one exception, during the experiment amounted to 0.108 to 0.134 gm. per day, fully as low as was obtained with the members of the soldier detail on their prescribed diet. It is clear, therefore, that physiological economy in nutrition is as safe for men in athletics as for men not accustomed to vigorous exercise." The energy value of the daily diet was on an average not far from 2,500 calories.

One of the interesting points discussed by the author has to do with the bodily output of uric acid. From the investigations as a whole it appeared that "we can greatly diminish the output of uric acid by simply restricting the extent of proteid katabolism, through reduction in the amount of proteid food."

The following are cited from the author's general conclusions: "On matters of diet every man should be a law unto himself, using judgment and knowledge to the best of his ability, reinforced by his own personal experiences. Vegetarianism may have its virtues, as too great indulgence in flesh foods may have its serious side, but there would seem to be no sound physiological reason for the complete exclusion of any one class of food stuffs, under ordinary conditions of life."

"Confining our conclusions to general statements, it may be said that our results, obtained with a great diversity of subjects, justify the conviction that the minimal proteid requirement of the healthy man under ordinary conditions of life is far below the generally accepted dietary standards, and far below the amounts called for by the acquired taste of the generality of mankind. Expressed in different language, the amount of proteid or albuminous food needed daily for the actual physiological wants of the body is not more than one-half that ordinarily consumed by the average man. Body weight (when once adjusted to the new level), health, strength, mental and physical vigor, and endurance can be maintained with at least one-half of the proteid food ordinarily consumed; a kind of physiological economy which, if once entered upon intelligently, entails no hardship, but brings with it an actual betterment of the physical condition of the body. . . .

"Physiological economy in nutrition means temperance, and not prohibition. It means full freedom of choice in the selection of food. It is not cereal diet nor vegetarianism, but it is the judicious application of scientific truth to the art of living, in which man is called upon to apply to himself that same care and judgment in the protection of his bodily machinery that he applies to the mechanical products of his skill and creative power. Food requirements must of necessity vary with changing conditions, but with due recognition of this fundamental principle, all the results so far obtained in this investigation, with a great variety of persons, point to the conclusion that the real demands of the body for proteid food do not exceed 50 per cent of the amount generally consumed. . . .

"Further, the total consumption of food by the average individual, nonnitrogenous as well as nitrogenous, is considerably greater than the real needs of the body demand, although here we must give closer heed to the varying requirements of the body incidental to varying degrees of activity. The man whose work is mainly mental has no real need for high fuel values in his daily ration. For such a man, a high potential energy in the daily intake of food is an incubus and not a gain. Body equilibrium can be maintained on far less than 3,000 calories per day by the brain worker. . . .

"Moreover, as our experiments have clearly indicated, even the man who is called upon to perform considerable physical work has no apparent need for a fuel value in his food of 3,000 calories per day. No doubt, the man who works at hard labor for 10 or 12 hours a day will require a larger intake of fats and carbohydrates, sufficient to yield even more than 3,000 calories, but this is not true of the moderate worker, nor of the average man whose work is in large measure mental rather than physical."

Studies of the food of Maine lumbermen, C. D. Woods and E. R. Mansfield (*U. S. Dept. Agr., Office of Experiment Stations Bul. 149, pp. 60, pls. 2*).—Five dietary studies and 6 digestion experiments were carried on in Maine lumber camps during the winter season when the men were engaged in severe manual labor.

On an average the diet furnished 182 gm. protein, 337 gm. fat, and 812 gm. carbohydrates, the fuel value being 6,995 calories. The cost per day was 23.5 cts. The large amounts of food eaten are attributed in great measure to the severe work in the open air and the cold to which the men were exposed. The diet was very simple in character, one of the principal articles being baked beans. Bread, cakes of various sorts, some vegetables, and fruit were also eaten with more or less meat and fish.

In the digestion experiments the results obtained with the different subjects were, on the whole, very uniform. On an average 85.3 per cent of the protein, 97.4 per cent of the fat, 98 per cent of the carbohydrates, and 88.4 per cent of the ash of the food were digested, and 92.6 per cent of the energy of the diet was made available.

Considered as a whole, the results agree quite closely with the average values obtained in a large number of American experiments made under widely varying circumstances. The authors note that, as has been observed in other experiments, when corrections for metabolic products obtained by the pepsin method are introduced, the coefficients of digestibility of protein are higher than when the corrections are obtained by the ether, alcohol, and limewater method. In both cases the corrected values are higher than those not corrected. During the digestion experiments it was found that animal foods furnished from about 33 to 50 per cent of the protein and from about 20 to nearly 50 per cent of the energy of the diet. Baked beans furnished from 20 to 33 per cent of the total protein and from 10 to 14 per cent of the total energy of the diet.

Dietary studies at the Government Hospital for the Insane, Washington, D. C., H. A. PRATT and R. D. MILNER (*U. S. Dept. Agr., Office of Experiment Stations Bul. 150, pp. 170, pls. 2*).—The investigations reported cover 22 dietary studies with patients and 4 with officers and attendants at the Government Hospital for the Insane.

In the case of the patients the food eaten on an average furnished 90 gm. protein and 2,704 calories of energy per man per day. In the case of the employees studied, the average diet furnished 123 gm. protein and 3,968 calories of energy. These amounts agree fairly well with the commonly accepted dietary standards for men performing similar amounts of work, and with what has been found in other institutions. During this investigation much attention was paid to recording data concerning waste and suggestions were made for lessening the waste and improving the diet.

"Waste can not be entirely avoided; more or less is inevitable; but it can be kept at a minimum. It is possible, even in large institutions, to provide for the utilization of food so that the losses shall be small. This can be accomplished by a better understanding of the nutritive values of different foods and of the demands of people for nourishment, and by improvements in the methods of preparing, cooking, and serving the food. Under such conditions it would be possible to provide a palatable, attractive, and nutritious diet at minimum cost. That reduction of cost was possible was demonstrated in the course of the studies here reported. . . .

"These investigations are interesting as affording data for use in determining dietary standards and also have a decided practical value, since the knowledge gained by a study of food conditions made it possible to suggest improvements in the institution diet which were immediately carried out, with the result that a considerable saving was possible without in any way lowering the quality of the diet."

In general, it was found that the food provided at the institution studied was abundant, of good quality, and well prepared and served. A brief account of this investigation has already been noted (E. S. R., 15, p. 703).

Cost of living and retail prices of food (*U. S. Dept. Com. and Labor, Ann. Rpt. Comr. Labor, 18 (1903), pp. 865, charts 2*).—The present paper contains articles on the cost of living and on the retail prices of foods in the United States.

Cost of living (pp. 13–631).—The statistics on the cost of living presented herewith are based upon data gathered in 25,440 families representing 124,108 persons living in the principal industrial centers of 33 States, including the District of Columbia. In the case of 2,567 families the data are presented in full, as there are reasons for believing that in these cases the data were especially satisfactory. These investigations have been previously noted from a brief summary (E. S. R., 15, p. 493).

Retail prices of food (pp. 633–853).—The statistics presented are based on a total of 5,302 schedules or statements of prices secured from 814 retail merchants for the years

1890 to 1902, and 5,293 schedules from 811 merchants for the year 1903. The region covered by the investigation was the same as in the case of the study of the cost of living.

Wholesale prices in the United States, 1890 to 1903, G. W. W. HANGER (*U. S. Dept. Com. and Labor, Bureau of Labor Bul. 54, pp. 1165–1190, charts 19*).—Data, largely in the form of charts, are given regarding the relative prices of farm products, foods, fuel, and lighting materials, and other commodities for the period mentioned, the data here presented being illustrative of that compiled for the exhibit of the Bureau of Labor at the Louisiana Purchase Exposition.

The functions and uses of food, C. F. LANGWORTHY (*U. S. Dept. Agr., Office of Experiment Stations Circ. 46, rev. ed., pp. 10*).—Using data which have accumulated since the circular was first published (E. S. R., 13, p. 476), the material presented has been revised.

Ground coffee, T. MACFARLANE (*Lab. Inland Rev. Dept., Canada, Bul. 100, pp. 7*).—Of 75 samples of ground coffee collected, 19 were found to be adulterated, and 8 were doubtful, while in the case of 3 samples the adulteration was declared.

Tea, A. MCGILL (*Lab. Inland Rev. Dept., Canada, Bul. 99, pp. 8*).—A large number of samples of tea were examined and all were found to be genuine.

The marmalade industry, II, E. HOTTER (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 10, pp. 689–724*).—Continuing earlier work (E. S. R., 15, p. 257), the making of jam and similar products on a commercial scale is discussed. Analyses of a large number of jams, marmalades, and similar products are reported.

Proposed regulations governing the labeling of imported food products, H. W. WILEY (*U. S. Dept. Agr., Bureau of Chemistry Circ. 21, pp. 2*).—The proposed regulations of the Bureau of Chemistry are given regarding the labeling of goods designed for import into the United States, containing sulphate of copper or anilin dyes, as well as the regulations for such foods as are prepared in oil or packed in oil.

Briefly speaking, the regulations insist that the use of copper sulphate or added coloring matter shall be plainly declared on the label, and that in the case of goods prepared with oil the kind of oil used shall be plainly stated.

National Association of State Dairy and Food Departments (*Jour. Proc. Ann. Conv. Nat. Assoc. State Dairy and Food Depts., 7 (1903), pp. 588, figs. 43*).—This volume includes the proceedings of the seventh annual convention of the Association of State Dairy and Food Departments, held at St. Paul, Minn., a compilation of the dairy and food laws of several States and Territories, with United States Supreme Court decisions thereon, also rulings, tables of standards adopted by the State and Government Commission, and a number of papers and addresses presented at the association meeting.

International catalogue of scientific literature. Q—Physiology (*Internat. Cat. Sci. Lit., 1904, pts. 1, pp. VIII+620; 2, pp. 621–1360*).—In this volume of the international catalogue, issued by the Royal Society of London, the bibliography of physiology, including experimental psychology, pharmacology, and experimental pathology, is continued, part 1 being the author catalogue and part 2 the subject catalogue. The present volume, the manuscript of which was completed September, 1903, is similar in scope and plan to those already issued (E. S. R., 15, p. 390).

ANIMAL PRODUCTION.

Glycogen formation and the rational feeding of sugar, J. ALQUIER and A. DROUINEAU (*Ann. Sci. Agron., 2. ser., 1903, I, Nos. 2, pp. 246–320; 3, pp. 321–328; 1903, II, Nos. 1, pp. 45–160; 2, pp. 161–198, 226–287; 3, pp. 334–468; 1904, I, Nos. 1, pp. 124–160; 2, pp. 161–271; 3, pp. 358–375; 1904, II, Nos. 1, pp. 98–160; 2, pp. 161–209, figs. 30*).—An exhaustive discussion of the carbohydrates which occur in the body, their formation, structure, function, and use, cleavage, sugar as a food for

man, sugar and molasses for different kinds of farm animals, and related topics. Sugar beets and other materials which are sources of sugar are spoken of, and investigations are summarized. The feeding experiments which have been reported by numerous investigators are also summarized and discussed, the article as a whole constituting an exhaustive digest and critical discussion of the subject of sugar in its relation to the diet and to the feeding of farm animals. Some investigations carried on by the authors are also included.

The effect of sugar and molasses on the time food is retained in the intestinal tract was studied with horses. Coloring matter was given with the ration and the feces were identified in much the same manner as when colored with lampblack in experiments with man. Feces from a normal ration were observed 27 hours after it was taken; from a ration with sugar, 27 to 28 hours, and from a ration with an equivalent amount of molasses, 16 hours. In other words, the molasses hastened the passage of the food through the digestive tract.

On the basis of personal observation and a summary of available data, the authors speak of the successful use of molasses and sugar in the ration of the horses of one of the large Paris cab companies. Molasses is regarded as a very valuable feed. Other data regarding its satisfactory use in horse feeding are summarized, including data obtained with race horses.

The effect of molasses on the production of milk and butter is one of the subjects considered, and a large amount of experimenting on this topic has been collected. The authors' general conclusion is favorable to the use of sugar and molasses as foods and feeding stuffs.

Concerning the formation of sugar from leucin, J. T. Halsey (*Amer. Jour. Physiol., 10 (1904), No. 5, pp. 229–235*).—Although the experiments reported, in the author's opinion, do not warrant final conclusions, he believes that they indicate that pure leucin fed to dogs which had been given phlorhizin is not changed into sugar. "There still remains the possibility that the leucin-complex, as it exists in proteid, may be concerned in the formation of sugar, or that when leucin is fed with the other end products of digestion . . . it, together with some other substance or substances, plays a rôle in the synthesis of sugar."

Experiments on the active substances of organs and tissues, A. Pugliese (*Jour. Physiol. et Path. Gén., 6 (1904), No. 2, pp. 254–260, dgms. 3*).—Experiments with the saline extracts of organs and tissues are recorded, the method of isolating the active substances being described as well as the chemical and physiological character of the bodies thus extracted. According to the author the anticoagulating action of the extracts of animal tissues, prepared by the method which he described, is due essentially to a substance which is precipitated when the solution is made alkaline.

The urine and the metabolism of herbivora, E. Salkowski (*Ztschr. Physiol. Chem., 42 (1904), No. 3, pp. 213–250*).—The principal questions studied were the occurrence of allantoin and the estimation of indican.

Chemical composition of Jerusalem artichokes, P. Behrend (*Ztschr. Spiritusind., 1904, June; Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 8, pp. 922–924*).—The uses of Jerusalem artichoke tubers for the production of alcohol and for feeding farm animals are spoken of.

Job's tears (*Jour. Jamaica Agr. Soc., 8 (1904), No. 10, p. 404*).—An analysis of Job's tears is quoted and the nutritive value of this grain discussed.

A plan for the improvement of American breeding stock, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 316–325; Circ. 62, pp. 316–325*).—The importance of improving breeding stock and the need of systematic investigations along this line by the Department of Agriculture are spoken of. Such work would necessarily include, as is pointed out, attempts to secure a more economical carcass, more efficient work, greater speed, beauty, and general useful-

ness, and higher prepotency and fertility in breeding stock. Attention is called to the need of controlling and regulating the importation of breeding animals.

State stock breeders' associations, G. M. ROMMEL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 64, pp. 53*).—The State stock breeders' associations may be divided, the author notes, into 2 groups, educational and protective, and abstracts are given of the constitutions of the societies which exist in different States, as well as specimen constitutions of live-stock associations. The officers and management, membership, meetings, and revenue of the educational associations are also spoken of.

The growth of the cattle industry of Cuba, I. D. LOPEZ (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 312–315*).—The possibilities of cattle growing in Cuba are briefly spoken of and recent statistics are given regarding the number of cattle slaughtered for food in the island, and also regarding the importation of cattle.

According to the author's computations the consumption of beef in Cuba in 1902 was 43.07 lbs. per capita, of pork 6.82 lbs., while the consumption of mutton was only 0.9 lb. per 100 inhabitants. Attention is called to the fact that the killing of cows, except those which are known to be barren, is prohibited, a measure which protects the cattle industry.

Feeding trials with Devon, Sussex, Hereford, and Shorthorn steers, M. J. R. DUNSTAN (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 43–45*).—A feeding test with 2 steers of each of the following breeds: Devon, Sussex, Hereford, and Shorthorn, is very briefly reported. The Sussex and Hereford steers were fed at a profit, the others at a loss. Considering the test as a whole there was a total net loss of \$1.62.

Students' aid to judging live stock, II, T. R. ROBINSON and K. J. J. MACKENZIE (*Jour. Southeast. Agr. Col., Wye, 1904, No. 13, pp. 55–63, figs. 2*).—Data regarding sheep and pigs are summarized with special reference to students' needs.

Dried beet pulp and dried molasses-beet pulp for fattening sheep, R. S. SHAW (*Michigan Sta. Bul. 220, pp. 43–50, pl. 1*).—The value of dried beet pulp and molasses-beet pulp was studied with 5 lots of 18 lambs each, the experimental period covering 85 days.

Lots 2, 3, and 5 were fed beet pulp with different proportions of mixed grain, lot 4 molasses-beet pulp with grain, and lot 1 grain. All the lots were fed clover hay. The gains ranged from 0.329 lb. per head per day with lot 3 (dried beet pulp, bran, and linseed meal 4:2:1), to 0.348 lb. with lot 2 (corn, bran, and linseed meal 4:2:1 with beet pulp). In the case of this lot the gain was most cheaply made, costing 3.84 cts. per pound. The most expensive gain, 4.88 cts. per pound, was noted with lot 1 (corn, bran, and linseed meal 4:2:1).

As regards palatability, the author's observations led him to conclude that sheep generally prefer the dried molasses-beet pulp to the dried beet pulp. Analyses of both materials are reported.

The lambs were sheared before slaughtering, the fleece ranging from 6.08 lbs. with lot 1 (corn, bran, and linseed meal) to 7.11 lbs. with lot 5 (dried beet pulp and linseed meal 3:1). Little difference was observed in the dressed weight of the different lots, which was about 52 per cent in every case. Other data were also recorded. Considering the test as a whole, the average calculated profit was \$1.18 per head.

In earlier tests, which are briefly reported, 15 wethers on grain and clover hay gained 256 lbs. in 40 days, the cost of a pound of gain being 7.87 cts. The same number fed grain with dried beet pulp about 3:2 and clover hay gained 275.3 lbs., at a cost of 6.35 cts. per pound. In each case 2.48 lbs. of concentrated feed and 1.41 lbs. of hay were eaten per head daily.

In a similar test with 2 lots of 10 lambs each the total gain for the lot fed grain was 160.3 lbs., and the cost of a pound of gain 5.33 cts. On the grain and dried beet pulp ration the total gain was 140.6 lbs., and the cost of a pound of gain 5.29 cts.

In the case of both lots the concentrated feed eaten was 1.9 lbs. per day. With the grain ration the clover hay eaten was 1.42 lbs., and with the beet-pulp ration 1.39 lbs.

From the investigations reported the following conclusions are drawn: "These tests seem to indicate that both dried beet pulp and dried molasses-beet pulp are possessed of feeding values comparing very favorably with corn. Grain mixtures containing dried beet pulp produce more mutton at less cost than similar amounts of grain mixtures alone. Dried molasses-beet pulp possesses a somewhat higher feeding value than dried beet pulp, but in this experiment the difference was not great enough to offset the difference in price."

Corn meal, middlings, and separator skim milk for fattening pigs, E. L. Shaw (*New Hampshire Sta. Bul. 113, pp. 139-143*).—Twenty uniform Yorkshire pigs were divided into 4 lots of 5 animals, each containing both sows and barrows. In the first 60 days lots 1 and 3 were fed, respectively, corn meal and wheat middlings, the grain being mixed with separator skim milk in the proportion of 1:4. Lots 2 and 4 were fed respectively the same grains mixed with water. At the close of this period lots 1, 2, and 4 were fed for an additional period of 60 days, to fatten them for market, corn meal and skim milk, and lot 3 corn meal and middlings 1:1, with skim milk.

During the first period the gains ranged from 0.273 lb. per head per day on middlings alone to 1.27 lbs. on corn meal and skim milk. The greatest range in feed consumed per pound of gain and in the cost of feed per pound of gain was also noticed with these 2 lots, the feed per pound of grain ranging from 3.39 lbs. on corn meal to 7.86 on middlings, and the cost from 4.32 cts. for the corn meal to 9.43 cts. for the middlings.

In the period on corn meal *v.* corn and middlings the smallest gain, 0.52 lb. per head per day, was made with the lot fed the mixed-grain ration. This lot also required the largest amount of feed per pound of gain, 5.82 lbs., at the highest cost, 7.64 cts. The greatest and most economical gain was made by one of the lots fed corn meal and skim milk. It amounted to 1.49 lbs. per head per day, this gain requiring 3.36 lbs. of feed per pound of gain at a cost of 4.29 cts.

Considering the test as a whole, there was an average gain of 10.1 lbs. in favor of the barrows as compared with the sows. The author's conclusions follow:

"The pigs receiving corn meal and separator skim milk were the most hearty feeders and made the best gains.

"The cost per pound of gain was over 2 cts. cheaper where skim milk was fed with corn meal and middlings. Corn meal produced much better gains and at a cost of 2.93 cts. cheaper than middlings.

"During the entire experiment the barrows made the better gains. The cost per pound of gain increased with the age of the pigs."

Pigs (*Jour. Jamaica Agr. Soc., 8 (1904), No. 10, p. 422*).—Brief notes regarding the relation of live to dressed weight and a summary of data showing that the amount of feed required per pound of gain increased with age.

Bacon curing on the farm, L. M. Douglas (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 371-376, figs. 2*).—English bacon curing, especially the Wiltshire method, is described, the article being reprinted from the Farmer and Stockbreeder Yearbook for 1904.

Reindeer and caribou, C. C. Georgeson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 377-390, pls. 7; Circ. 55, pp. 377-390, pls. 7*).—A historical account of the introduction of domestic reindeer into Alaska, together with a discussion of the importance of these animals for food and for draft purposes, the need of improving the breed, diseases, and other topics.

"The zone of the usefulness of the reindeer lies wholly outside that in which agriculture is possible. It lives chiefly on the lichen and herbage indigenous to the region where no agricultural plants will grow. It will not thrive in the warmer

regions where agriculture is practicable, and it can not live on the kind of forage which we feed to cattle and horses. Wherever the ground can be cultivated its place will be taken by the horse and ox. But it is by far the most useful animal for the region north of the agricultural belt. It is the means of transmuting a vast amount of vegetation into meat and skins necessary to the support of the Eskimos."

The Government's importation of camels: A historical sketch, C. C. CARROLL (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 391–409; Circ. 53, pp. 391–409*).—A detailed account is given of the attempts which were made by the United States Government from about the middle of the nineteenth century and later to introduce camels into the southwestern United States. A number of importations were made and the results obtained were fairly promising. Attention is also drawn to the reasons which led to the final sale of the herd and the decline of interest in the project.

The poultry and egg industry of leading European countries, A. FOSSUM (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 65, pp. 79*).—Statistical and other information is given regarding the number of poultry and the poultry and egg industry in the principal European countries, attention being paid particularly to cooperative poultry societies. In the appendixes the author gives the rules governing the Society for Poultry Breeding in Denmark, the Society for the Promotion of Poultry Breeding in Denmark, the Society for Profitable Poultry Breeding, and the Danish Cooperative Egg Export Society.

Imports of meat, meat products, eggs, and dairy products into the United Kingdom, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 452–465*).—Statistics are given of the imports into Great Britain for 1901–1903, inclusive.

Imports and exports of animals and animal products, J. ROBERTS (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 466–518*).—An extended compilation of statistical data.

Notes for preparing carcass pork, veal, and dressed poultry for market, J. W. SANDFORD (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 12, pp. 687, 688*).—Brief directions are given for dressing pork, veal, and poultry to meet the demands of the local market.

DAIRY FARMING—DAIRYING.

Home-grown protein as a substitute for purchased feeds and tests of soiling crops, C. F. DOANE (*Maryland Sta. Bul. 98, pp. 57–83*).—Eight feeding experiments with dairy cows, in which comparisons were made of leguminous crops and commercial feeding stuffs as a source of protein, are reported. Brief notes on the culture of alfalfa and cowpeas are included.

Alfalfa hay and corn meal v. corn silage and mixed grains.—A ration made up of silage prepared from well-eared corn and a grain mixture consisting of 3 lbs. of malt sprouts, 1 lb. each of linseed meal, gluten meal, and corn chop was compared with a ration of alfalfa hay and 7 lbs. of corn meal. The nutritive ratios were respectively 1:5.5 and 1:5.3. The test included 15 cows and covered 2 periods of 28 days each. The results showed a considerable difference in milk production in favor of the alfalfa ration.

Alfalfa hay and corn silage without grain.—Three cows previously fed on corn silage and mixed grains were fed for 15 days a mixture of 10 lbs. of alfalfa and 20 lbs. of corn silage, and for a following period of 15 days the former silage and grain ration. Although the alfalfa and silage ration had a nutritive ratio of 1:5.5, it failed to give as satisfactory results judged from the yield of milk as the silage and grain ration. Apparently some concentrated food was necessary.

Cowpea hay and cowpea silage as feed for cows.—Comparative tests were made of cowpea hay, cowpea silage, corn silage, and a mixture of equal parts of cowpea and corn silage as roughage for cows. In each instance a nutritive ratio of 1:5.5 was approximated by means of varying proportions of hominy chop, wheat bran, and gluten meal. Each ration was fed to 6 or 7 cows for 30 days, the data obtained during the last 23 days of this period being compared with the data secured during 8 days preceding the feeding period.

Cows receiving cowpea hay alone showed on an average a decrease in yield of milk of 1.1 lbs. per day, while cows fed corn silage showed an increase of 0.7 lb., cows fed the mixture of corn and cowpea silage an increase of 1.7 lbs., and cows fed cowpea silage alone an increase of 1.9 lbs., indicating, on the whole, that cowpea silage is more valuable for milk production than corn silage.

Comparison of cowpea silage with corn silage.—A further comparison of these two kinds of silage was made the following winter when a better quality of the cowpea silage was available. The herd was divided into two lots and fed each kind of silage in alternating periods, the supplementary grain ration used being uniform. The results are considered as furnishing satisfactory proof of the superiority of cowpea silage over corn silage.

Alfalfa and cowpeas in addition to enriching the soil may, therefore, be grown for the purpose of supplying to a large extent if not entirely the protein in rations for cows.

Comparison of rye soiling with silage.—Rye was cut and fed to the herd for one week, the results showing a decided decrease in the yield of milk as compared with the previous week when silage was fed. The grain ration was the same. It is believed that the value of green rye has been much overestimated.

Comparison of rye and wheat for soiling crops.—Green rye and green wheat were fed to 21 cows in successive periods of 15 days each, and notwithstanding the tendency to decrease in yield due to advancing lactation, the results showed an average daily gain of 1 lb. of milk per cow during the latter period. Wheat is, therefore, believed to be more valuable than rye as a soiling crop.

Comparison of soiling and pasture.—Ten cows were fed green corn for one week, following which period 5 of the cows were continued on green corn and 5 turned on a luxuriant grass and clover pasture for 35 days. The cows changed to pasture increased in their average daily yield of milk from 15.8 to 17.2 lbs., and the cows fed corn continuously decreased from 15.3 to 14.9 lbs., making a difference, therefore, of 1.8 lbs. of milk per day in favor of the pasture. Some advantages of soiling over pasturing, such as the greater quantity of feeds obtained per acre, and consequently the greater number of cows that can be kept on a given area, are, however, pointed out in connection with this and the following experiment.

Comparison of dry feed and pasture.—An average daily gain of 4.7 lbs. of milk per cow was obtained from 7 cows by pasturing during May as compared with supplying dry feed during April. This gain, moreover, was accompanied by a decrease in the amount of grain consumed.

Replacing grain with alfalfa in a ration for dairy cows, A. M. Soule and S. E. Barnes (*Tennessee Sta. Bul., Vol. XVII, No. 4, pp. 69–92, figs. 8*).—In previous experiments (E. S. R., 14, p. 605) it was found that cowpea hay could be substituted with profit for a part of the cotton-seed meal or wheat bran commonly fed to cows. In the present bulletin similar investigations with alfalfa hay are reported.

Twelve cows were divided into 3 groups, one of which was fed corn silage, wheat bran, and cotton-seed meal; one, corn silage, alfalfa hay, and cotton-seed meal; and one, corn silage, alfalfa hay, and wheat bran. The feeding period was 4 months.

Lot 1 consumed 21,376 lbs. of silage, 3,624 lbs. of wheat bran, and 1,207 lbs. of cotton-seed meal, and produced 7,521 lbs. of milk and 439.05 lbs. of butter fat. Lot 2 consumed 20,558 lbs. of silage, 3,638 lbs. of alfalfa hay, and 1,871 lbs. of cotton-seed

meal, and produced 7,689 lbs. of milk and 424.89 lbs. of butter fat. Lot 3 consumed 16,139 lbs. of silage, 3,350 lbs. of alfalfa hay, and 3,725 lbs. of wheat bran, and produced 6,414 lbs. of milk and 347.99 lbs. of butter fat. The digestible matter consumed by the 3 lots for the production of a gallon of milk was, respectively, 6.5, 6.6, and 7.9 lbs., and for the production of a pound of butter, 11.3, 12.1, and 14.7 lbs.

From these results it is concluded that 1 lb. of cotton-seed meal could be replaced by about 3 lbs. of alfalfa hay, and 1 lb. of wheat bran by about 1.5 lbs. of alfalfa hay. The limit of this substitution will depend upon the individual capacity of the animals to consume the hay. It is stated that ordinarily not more than 10 to 12 lbs. of hay will be consumed when fed with silage, but that this amount may be increased to 15 to 20 lbs. when fed without silage. In this experiment the favorable results following the substitution of alfalfa for a part of the concentrates were attributed in a large measure to the feeding of these materials with a fine quality of silage.

The net cost of producing a gallon of milk, allowance being made for the cost of food and attendance and also for the value of the manure, was 7.1 cts. for lot 1, 5.7 for lot 2, and 8.2 for lot 3. The net cost for a pound of butter was, respectively, 12.3, 10.4, and 15.3 cts. From the standpoint of economic production the best results were, therefore, obtained with lot 2. With alfalfa hay at $10 per ton and wheat bran at $20 the saving effected by substituting alfalfa for wheat bran is estimated at 19.8 cts. per 100 lbs. of milk and $2.80 per 100 lbs. of butter.

Comparing the present with the earlier experiment it was found that when cowpea hay was fed under the most favorable conditions a gallon of milk cost 5.2 cts. and a pound of butter 9.4 cts., when alfalfa hay was fed the figures were, respectively, 5.7 and 10.4 cts. On the whole the results would seem to prove that in localities where cowpeas grow well this crop may be economically and satisfactorily substituted for wheat bran, and in localities where alfalfa succeeds better this crop may be used with about equally good results.

Feeding experiments with cows, C. D. WOODS (*Maine Sta. Bul. 106, pp. 122–126*).—In an experiment with 6 cows a comparison was made of soy bean and corn silage with corn silage alone. While the results are not considered entirely satisfactory, they are believed to indicate that, on the whole, the cows did practically as well on corn and soy bean silage with 1 lb. less grain as on corn silage.

In a second experiment, a comparison was made between a proprietary mixture known as Union Grains and a grain mixture composed of wheat bran, cotton-seed meal, and linseed meal, the latter mixture containing a little more protein but less fat than the former. Eighteen animals were used in the experiment which covered 3 periods of 1 week each with intervening periods. The experiment was not considered entirely satisfactory owing to a change of milkers, but the results were believed to show that on the whole the proprietary ration was better for milk production than the oil meal and bran ration, although the latter was the less expensive ration.

Record of an attempt to increase the fat in milk by means of liberal feeding, H. H. WING and J. A. FOORD (*New York Cornell Sta. Bul. 222, pp. 19–39, figs. 11*).—The private herd selected for the investigations reported in this bulletin consisted at the start of 21 cows, the larger number of which were comparatively young and in the same stage of lactation. The herd, which was located on a farm near Cornell University, had had a history of insufficient feeding for several years.

The experiments began in March, 1900. For 1 lactation period the cows were kept under exactly the same conditions as before, and a record of the yield and fat content of milk was obtained. Ten of the cows were then taken to the University and fed liberally for 2 lactation periods, at the close of which the 7 cows remaining of this number were returned to the farm from which they were obtained, and kept there for a fourth lactation period under conditions practically identical with those during the first period.

During the second lactation period of the experiment, or the first period at the university, the cows were fed as much nutritious and easily digestible food rich in protein as they would readily eat, no attention being paid to the economy of production. During the following period at the university the cows were given similar foods, but were fed with an idea of producing milk economically. Records of the individual cows are summarized and photographs taken in different years are reproduced.

The following table gives the fat content of the milk of the 7 cows remaining in the experiment until the end, the first and fourth periods under adverse conditions on the farm being averaged and compared with the average of the second and third periods of liberal feeding at the university:

Fat content of the milk of cows insufficiently and liberally fed.

Name of cow.	Fat content of milk. Under insufficient feeding.	Fat content of milk. Under liberal feeding.	Actual gain under liberal feeding.	Percentage gain under liberal feeding.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Dena	4.91	5.24	0.33	6.7
Patty	4.26	4.67	.41	9.6
Polly	5.95	6.08	.13	2.2
Rena	3.55	3.76	.21	5.9
Rita	3.91	4.25	.34	8.7
Stella	5.01	5.11	.10	2.0
Tilda	3.56	3.79	.23	6.5
Average gain			.25	5.9

Each cow, without exception, gave richer milk on liberal rations, the percentage of fat being increased nearly 6 per cent. So far as this experiment goes, it is believed to show, therefore, that the percentage of fat in milk can be increased by more and better food. By reference to the fuller data it is pointed out that the greatest increase in fat was during the second period, and that in the third period there was a marked reduction and in the fourth it was even lower than the first period. Comparing the fourth with the first, the average decrease in the percentage of fat for the 7 cows taken to the university was 0.03 per cent, while the average decrease for 5 cows which had remained continuously on the farm was 0.13 per cent.

While incidental to the main purpose of the experiments, it was ascertained that the total increased production of milk and fat due to liberal feeding amounted to about 50 per cent, and that this was secured economically so far as the cost of the food was concerned.

Investigations on the influence of food fat and some other food constituents upon milk production, A. Morgen, C. Berger, G. Fingerling et al. (*Landw. Vers. Stat., 61 (1904), No. 1-4, pp. 1-284*).—This is a detailed report of investigations with sheep and goats begun in 1900 and continued for 4 years. In the introduction some of the more recent literature is reviewed, and at the conclusion is a note stating that the experiments in a somewhat modified form are being continued.

The experiments with sheep included 2, 2, 7, and 5 animals in successive years, and those with goats 1, 1, and 3 animals. The leading idea in the experiments was to compare a ration nearly free from fat with one rich in fat, as it was believed that in this way any influence of fat would be more certainly manifested than by the comparison of a normal ration with one made excessively rich in fat, as many other investigators have done. In some instances a ration was used which contained as small an amount of digestible fat as 0.05 gm. per kilogram live weight, or 3 to 4 gm. per head daily.

Such a ration, extremely poor in fat but which was found adapted to the experimental animals, inasmuch as they not only remained in good condition but gained in live weight, was not favorable to milk production. The substitution of a thermically equivalent quantity of fat for a portion of the carbohydrates in such a ration exerted a very favorable influence upon milk production, increasing the yield of milk and milk constituents and also the percentages of fat and milk solids.

The substitution of protein for a like quantity of carbohydrates in the ration deficient in fat was also favorable as regards milk production, but was without influence on the fat content of the milk, and therefore not able in this respect to take the place of food fat. In rations deficient in fat neither carbohydrates nor protein could, therefore, be substituted satisfactorily for food fat furnished in quantities of 0.5 to 1 gm. per kilogram of live weight.

Increasing the food fat to 1.5 to 2 gm. per kilogram live weight caused, in individual cases only, a further increase in the production of milk fat, while in other instances the increase was without influence or the larger quantity was even of less value than the smaller quantity. It is, therefore, concluded that from 0.5 to 1 gm. of fat in food per kilogram of live weight is apparently sufficient in general for the function which food fat exerts in milk production.

The experiments are believed to furnish additional proof to the generally accepted view that food fat is by no means the only constituent that enters into the formation of milk fat. The addition of either peanut oil or mutton tallow to the ration deficient in fat increased the iodin and refractometer numbers of the milk fat to normal figures or at times above. The two fats had practically the same effect in this respect.

Food from which the fat had been extracted, but to which fat was later added in the forms mentioned, did not exert the same influence on milk production as a normal ration showing the same composition, which difference in influence is attributed to a loss of certain irritating or stimulating substances in the former case. In some of the experiments this deficiency was very nearly overcome by the addition of irritating substances, such as fennel, anise, or hay extract. The influence of irritating substances in the absence of food fat was less marked and uncertain. Such substances so far as studied had no influence upon the properties of the milk fat.

As regards live weight of the animals, the different rations showed only a small but varying influence, yet taking the results as a whole, it is considered clear that the food deficient in fat exerted not only no unfavorable influence, but rather a favorable one on live weight, which, in view also of the fact that the animals were always in good health, showed that such food is very satisfactory for maintenance.

The principal results of the investigations may therefore be stated as follows: To a certain extent food fat exerts an invariably favorable influence on the production of milk fat, and in this influence fat can not be replaced by carbohydrates or proteids. Moreover, food fat appears to be a specially favorable material for the formation of milk fat. In the food of dairy animals fat can not therefore be omitted, while for the maintenance of animals it may be a more nonessential food constituent.

From the standpoint of practical feeding, the experiments, so far as they go, show that in all normal rations fat is entirely sufficient for milk production, and that an addition of fat and materials rich in fat is necessary only when the rations are composed of straw, roots, or other materials very poor in fat. The manner in which food fat exerts its influence is discussed, the conclusion being drawn that like other food constituents it serves merely as material for the formation of milk, but is for this purpose an exceptionally suitable material, perhaps better than protein, at any rate better than carbohydrates.

In these experiments irritating substances, such as fennel, anise, and malt sprouts, were believed to have exerted no favorable influence upon digestion and a favorable influence directly upon the cells concerned in milk secretion only in cases where

the foods were previously deficient in such substances, which would rarely be the case in practice.

The transformation of food fat into milk fat, S. Gogitidse (*Ztschr. Biol., 45 (1904), No. 4, pp. 353–371, dgm. 2*).—In 3 experiments with sheep and 1 with a dog linseed oil in varying quantities was fed and determinations were made of the iodin number of the milk fat before, during, and after the oil-feeding period. The linseed oil caused a rapid increase in the iodin numbers, which, after the oil was withdrawn from the rations, slowly returned to the normal. As much as 33 per cent of the constituents of the linseed oil was estimated as having passed directly into the milk fat.

The slowness with which the iodin numbers of the milk fat decreased indicated that a portion of the linseed oil had been transformed into body fat during the feeding period and later retransformed into milk fat. It is therefore concluded that food fat passes into the milk in two ways, (1) directly and (2) indirectly through the body fat, the greater part of the transformation taking place directly. A marked decrease in the yield of milk was attributed to the influence of the linseed oil. A bibliography is appended.

Note on Dr. S. Gogitidse's article entitled, "The transformation of food fat into milk fat," W. Caspari (*Ztschr. Biol., 46 (1904), No. 2, pp. 277–279*).—Attention is called to investigations by the author, published in 1899 (E. S. R., 11, p. 973), the results of which were essentially the same as those recently obtained by Gogitidse in the article noted above. Caspari estimated that in his experiments 32.49 per cent of the milk fat came from the iodin fat fed; Gogitidse, 33 per cent from linseed oil.

Comparative investigations on the quality and quantity of the milk of the two principal breeds in Carinthia, H. Svoboda (*Österr. Molk. Ztg., 11 (1904), Nos. 14, pp. 191–193; 15, pp. 205–207; separate from Carinthia II, 1904, No. 2–3, pp. 31*).—From data collected during a period of 3 years the following averages were obtained for the 2 breeds of cows: *Mölltaler*, annual yield, 2,056 to 2,250 kg.; specific gravity of the milk, 1.0328; total solids, 13.22 per cent; fat, 3.86 per cent; solids-not-fat, 9.39 per cent; *Blondvieh*, annual yield, 2,089 to 2,409 kg.; specific gravity of the milk, 1.0328; total solids, 12.76 per cent; fat, 3.67 per cent; and solids-not-fat, 9.09 per cent.

Report of the experiment station and school for dairying at Kleinhof-Tapiau, 1903-4, Hittcher (*Ber. Tät. Vers. Stat. u. Lehranst. Molkw. Kleinhof-Tapiau, 1903–4, pp. 11*).—This is a summary of the work during the year, with tabulated data showing the average yield and composition of the milk of over 100 cows and also variations from morning to evening and from day to day in the yield and composition of the milk.

The average composition of the milk of 118 cows for 10 years (1887–1897) was as follows: Specific gravity, 1.0306; fat content, 3.18 per cent; total solids, 11.73 per cent; solids-not-fat, 8.55 per cent. The lowest fat content was 2.36 per cent. During 1903–4 the fat content averaged 3.50 per cent, the extreme daily variations being 2.61 to 3.50 per cent. Total solids varied from 11.095 to 12.263, and averaged 11.613 per cent.

Report of the experiment station and school for dairying at Wreschen, 1903-4, H. Tiemann (*Tät. Ber. Vers. Stat. u. Lehranst. Molkw. Wreschen, 1903–4, pp. 22*).—This contains an outline of experimental work during the year with statements concerning results obtained. The work included tests of dairy apparatus, a study of some molds in dairy products, chemical and bacteriological investigations of the butter in the Province of Posen, studies of methods of examination of milk and milk products for the detection of adulteration, analyses of dog's milk, etc.

Report of the Brown Swiss Cattle Breeders' Association, P. Knüsel and H. Abt (*Landw. Jahrb. Schweiz, 18 (1904), No. 7, pp. 271–316, figs. 2*).—Among other

data included in this report are records of the yield and quality of the milk of 50 or more cows of this breed. The average yearly yield of milk of 28 cows was 4,131.4 kg. The average percentage of total solids was 13.16 and of fat 3.89.

The cellular and bacterial content of cows' milk at different periods of lactation, D. H. BERGEY (*Univ. Pennsylvania Med. Bul., 17 (1904), Nos. 5–6, pp. 181–183*).—The results of investigations in 1903 support the author's conclusion drawn from earlier work (E. S. R., 13, p. 587), that a high cellular and bacterial content of milk is associated with some inflammatory process within the udder. The relation of the period of lactation to the cellular and bacterial content of milk was studied in the present investigation with 3 cows, one of which had contagious mammitis.

In the present and earlier work the author has adopted the arbitrary standard proposed by W. R. Stokes that the presence of more than 10 cells per field of a $\frac{1}{12}$ immersion lens constitutes pus. When an average of 10 or more cells are present in 10 fields, it is stated that the cells are usually more or less clumped, which is believed to be an additional factor in the diagnosis of pus. A lower cellular content than 10 is taken as the normal leucocyte content. Data obtained in this investigation are tabulated and the conclusions quoted below are believed to be warranted by the results. It is stated that the detailed studies will appear in the Annual Report of the Dairy and Food Commission for 1904.

"The occurrence of pus in cows' milk is probably always associated with the presence in the udder of some inflammatory reaction brought about by the presence of some of the ordinary pyogenic bacteria, especially of streptococci.

"When a cow's udder has once become infected with the pyogenic bacteria the disease tends to persist for a long time, probably extending over several periods of lactation.

"Lactation has no causative influence per se upon the cellular and bacterial content of cows' milk, though it probably tends toward the aggravation of the disease when the udder is once infected.

"The so-called 'gelbe galt,' or contagious mammitis of European writers, appears to be merely a severe form of mammitis due to a variety of streptococcus which, on account of its chromogenic properties, gives to the milk its peculiar golden-yellow color."

The initial contamination of milk, R. C. NEWTON (*Jour. Amer. Med. Assoc., 43 (1904), No. 19, pp. 1387–1391*).—Experiments are cited which are believed to justify the conclusion that no milk should be offered for sale which contains over 30,000 bacteria per cubic centimeter. The use of the covered milk pail as a means of lessening contamination is believed to be in the direction of simplicity and common sense.

Study of formaldehyde in milk: Its germicidal action and the gradual disappearance of it from the milk, D. RIVAS (*Univ. Pennsylvania Med. Bul., 17 (1904), Nos. 5–6, pp. 175–180*).—A relatively low number of bacteria in samples of market milk, combined with negative results in chemical tests for preservatives, led to a study of this subject.

Five samples of milk were kept at a temperature of 6 to 8° C., 5 at 20 to 22°, and 5 at 37°. Each sample was divided into 2 portions, one of which was used as a control, while the other was treated with formaldehyde in the proportion 1:1,000; 1:10,000; 1:20,000; 1:50,000; or 1:100,000. Bacteriological and chemical examinations were made at frequent intervals. On the whole, formaldehyde showed a decided germicidal action when used in the proportion of 1:1,000, some of the samples becoming completely sterile. Even when used in the proportion of 1:100,000 the germicidal action was constant although weak.

As regards the disappearance of the formaldehyde from the milk, which was the main purpose of the investigations, it was found that when the preservative had been added in the proportion of 1:50,000 or 1:100,000, it had usually disappeared at the

end of 24 hours and in no instance was it present after 3 days. A diminution in the amount present was recognized as early as the sixth hour. In the proportion of 1:10,000 and 1:20,000 its disappearance was also rapid and in most instances was complete at the end of 5 days. In the proportion of 1:1,000 the disappearance was very slow, scarcely any change being observed up to the tenth day, although by the twenty-fifth day it had partially disappeared. In all instances the disappearance of the formaldehyde was more rapid at high than at low temperatures.

"The fact that samples of market milk show unusually good keeping qualities and yet apparently do not contain formaldehyde, should at once raise suspicion that these samples may have had formaldehyde added to them, and that in time the formaldehyde has disappeared from such milk."

The suitability of hydrogen peroxid for the sterilization of milk, P. Gordan (*Centbl. Bakt. u. Par., 2. Abt., 13 (1904), No. 22–23, pp. 716–728*).—Budde's method of sterilizing milk (E. S. R., 14, p. 1009), by the addition of hydrogen peroxid combined with heating the milk was tested. The results showed that in the small quantities recommended by Budde the hydrogen peroxid was entirely incapable of sterilizing the milk, and that not until 3 times the quantity recommended was added were all the bacteria destroyed.

Small quantities of hydrogen peroxid had no appreciable influence on the taste of the milk. Larger quantities caused a biting, unpleasant taste, and in quantities of 0.1 per cent it rendered the milk unfit for human consumption. Typhoid bacilli and spores of *Bacillus subtilis* added to milk were not destroyed by the Budde method (0.35 cc. of hydrogen peroxid per liter of milk with heating to 50° C.), although in quantities of 0.07 per cent or more positive results were obtained.

Obtaining raw sterile milk, H. de Waele, E. Sugg, and A. J. J. Vandevelde (*Centbl. Bakt. u. Par., 2. Abt., 13 (1904), No. 1–3, pp. 30–35*).—Raw sterile milk adapted for use as a culture medium was obtained by treating milk with 0.3 to 0.4 per cent of hydrogen peroxid, allowing the sample to stand for 3 to 8 days, and then removing the undecomposed hydrogen peroxid by the addition to each 100 cc. of milk of 0.1 to 0.2 cc. of defibrinated laked blood sterilized by the addition of 1 per cent of formalin. A bibliography is appended.

On the proteolytic enzyms of milk, A. J. J. Vandevelde, H. de Waele, and E. Sugg (*Beitr. Chem. Physiol. u. Path., 5 (1904), No. 11–12, pp. 571–581*).—Sterilization of milk was secured by the use of hydrogen peroxid, which was not believed to affect the enzyms present. In this way the authors demonstrated the presence of a proteolytic enzym in milk and showed that the action of this enzym was increased by an alkaline reaction and by an increase in temperature. A slight proteolytic action was attributed to the hydrogen peroxid itself, but this was easily distingushed from that of the enzym.

The occurrence of changes in the composition of milk sterilized with hydrogen peroxid was also demonstrated by means of serum tests with guinea pigs, and further by the time required for coagulation with rennet. Under the conditions of one series of the rennet tests fresh milk became coagulated in 1 hour and 45 minutes. This time was shortened to 50 minutes by the addition of hydrogen peroxid. In samples so preserved the time required for coagulation increased with the age of the sample, until at the end of 78 days it was 3 hours and 10 minutes. Some of the literature of the subject is briefly reviewed.

On the isolation of fermentative enzyms from cows' milk, J. Stoklasa et al. (*Ztschr. Landw. Versuchw. Oesterr., 7 (1904), No. 11, pp. 755–774, fig. 1*).—Fresh milk was treated with alcohol and ether and the resulting precipitate or crude enzym was collected by filtration through linen cloth and dried to remove all traces of the precipitants. Sterile lactose solutions were fermented with the enzym thus obtained under conditions excluding bacterial action, and the decomposition products

were estimated by methods which are described in full. The lactose was decomposed into lactic acid, carbon dioxid, alcohol, acetic acid resulting probably from the oxidation of the alcohol, and traces of butyric acid. A bibliography is appended.

Syllabus of illustrated lecture on the care of milk, R. A. PEARSON (*U. S. Dept. Agr., Office of Experiment Stations, Farmers' Inst. Lecture 1, pp. 12*).—This syllabus was prepared for the purpose of aiding farmers' institute lecturers in their presentation of this subject before institute audiences. On the margins of the pages are numbers which refer to a series of lantern slides prepared for illustrating the lecture. References to recent literature of this subject are appended.

How to keep milk and cream sweet and cool, G. S. THOMSON (*Queensland Agr. Jour., 15 (1904), No. 1, pp. 466–472*).—Practical experiments in aerating and cooling milk are reported. Brief notes are also given on cooling dairy buildings.

Mechanical methods of purifying milk, P. DIFFLOTH (*Presse Méd. [Paris], 1904, No. 96; abs. in Jour. Amer. Med. Assoc., 44 (1905), No. 1, p. 75*).—During a period of 8 months the author made tests to determine the efficiency of a Swedish filter consisting of 2 wire strainers with an interposed layer of cotton. Inoculation experiments with animals failed to show the presence of any pathogenic bacteria in the filtered milk. The keeping quality of such milk was found to be increased. Objections were raised to the use of centrifugal force on the ground that it increases the multiplication of bacteria and interferes with the so-called "stereochemistry" of the milk.

Changes produced in milk and cream under the process of pasteurization, and the effects of pasteurization on the production of butter, J. S. REMINGTON and M. E. WYER (*Aynsome Agr. Sta., Grange-over-Sands, Bul. 2, pp. 7*).—Samples of cream containing, respectively, 52.8, 52.61, and 56.2 per cent of fat were pasteurized at 70° C. and rapidly cooled.

The viscosity of the unpasteurized samples at 52° C is stated as 61, 66, and 80 seconds, and of the corresponding pasteurized samples as 71, 72, and 85 seconds. The lowering of the viscosity was attributed to the evaporation of water, as shown by Steiner (E. S. R., 13, p. 485), for when water was added to replace that lost the effect was lessened. Pasteurization exerted no constant influence on the specific gravity. Samples of milk were secured from 4 cows morning and evening, and from the mixed milk of the herd on three different dates, separated by intervals of 10 days. In every instance pasteurization was found to increase the time required for coagulation by rennet. The difference was often 1 minute or more. The completeness of coagulation was usually hindered by pasteurization.

In butter-making experiments, pasteurization decreased the time required for churning and increased the yield and improved the quality of the butter. The water content of 3 samples of the butter from unpasteurized cream averaged 9.89 per cent, and of the corresponding samples from pasteurized cream, 10.45 per cent, showing that the increased yield of butter from pasteurized cream is associated with a higher water content of the butter. It is also believed that pasteurisation decreases the loss of fat in the process of churning.

Sanitary supervision of the collection and marketing of milk, D. H. BERGEY (*Univ. Pennsylvania Med. Bul., 17 (1904), Nos. 5–6, pp. 187–192*).—In a discussion of this subject the author reports determinations of the bacterial content of freshly drawn milk, market milk, and pasteurized milk. Recent estimates are quoted to the effect that 150,000 infants die each year in Germany as the result of using impure milk.

In a dairy in which great care was taken to prevent contamination of milk, the bacterial content of the milk increased during straining and cooling from 50 bacteria per cubic centimeter in the milk pail to 9,875 in the tank below the cooler, while in another dairy in which the conditions were not so satisfactory, the increase was

from 850 to 173,600. The average bacterial content of 10 samples of milk collected at the railroad depots in Philadelphia in July, 1900, was nearly 5,000,000 per cubic centimeter. In one instance the number of bacteria per cubic centimeter was reduced from 5,040,000 to 110,000 by pasteurization, and in another instance from about 500,000 to 2,000.

The dangers of an impure milk supply, H. A. WOODRUFF (*Agr. Student's Gaz., n. ser., 12 (1904), No. 2, pp. 51–58*).—The author discusses the transmission of tuberculosis, foot-and-mouth disease, diphtheria, scarlet fever, typhoid fever, and other diseases by means of milk, and suggests amendments in existing legislation considered necessary for the effective control of the milk supplies of England and Wales.

An outbreak of diphtheria traceable to ulcers on cows' teats, W. ROBERTSON (*Public Health [London], 17 (1905), No. 4, pp. 246–250, fig. 1*).—An account is given of an outbreak of diphtheria in Leith believed by the author to be due to infected milk from a herd in which many of the cows had ulcerated teats. An organism resembling the Klebs-Loeffler bacillus was isolated from the ulcers.

The Babcock test for New Hampshire farmers, I. C. WELD (*New Hampshire Sta. Bul. 114, pp. 147–158, figs. 18*).—Tests of a herd of 8 cows, morning and night for 3 days, are given to illustrate variations in milk, following which the average composition of milk is stated. A description is given of the Babcock tester, and directions are given for taking samples, adding the acid, whirling the bottles, and reading the results. The application of the Babcock test to cream, skim milk, and buttermilk is also discussed, and suggestions are made concerning the cleansing of the glassware. The New Hampshire law regarding the use of milk tests is appended.

On the influence of the state of health on the freezing point of the milk, GUIRAUD and LASSERRE (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 8; abs. in Rev. Gén. Lait, 3 (1904), No. 21, pp. 498, 499*).—Cryoscopic experiments with human milk, from cases of jaundice, albuminuria, syphilis, and tuberculosis, and with milk from tuberculous cows, and from goats affected with mammitis, showed that in all these pathological cases the freezing points were lower than normal.

On a case of abnormal milk, DEBAINS and DESOUBRY (*Rec. Méd. Vét., 81 (1904), No. 6; abs. in Rev. Gén. Lait, 3 (1904), No. 22, p. 523*).—In the alteration observed by the authors the cream had an oily and slightly gelatinous consistency, while the remainder of the milk possessed normal characters which distinguished the condition from ropy or slimy milk. The cause was believed to be bacterial infection, and the trouble disappeared after disinfecting measures were employed.

On some determinations of the viscosity of milk, C. MADELLA (*Staz. Sper. Agr. Ital., 37 (1904), No. 4–5, p. 382; abs. in Rev. Gén. Lait, 3 (1904), No. 20, p. 476*).—From determinations made with Pagliani's viscometer the author concludes that there is a relation between the coefficient of viscosity and the percentage of the different constituents in milk, and that every diminution in these constituents causes a lowering of the specific gravity.

What ought one to know concerning milk, butter, and cheese? B. WOLFSHOFER (*Was muss man von der Milch-, Butter-, und Käsewirtschaft wissen? Berlin: Hugo Steinitz, 1904, pp. 80*).—Various topics, such as milk faults, handling of milk, milk as food, butter making, cheese making, etc., are treated in a very brief and popular manner.

On some milk products, J. MAYRHOFER (*Ztschr. Landw. Versuchw. Oesterr., 7 (1904), No. 11, pp. 797–804*).—Condensed milk, milk powder, plasmon, lactogen, and some other preparations were analyzed. The average composition of 6 samples of sweetened condensed milk was as follows: Nitrogenous substances, 11.86; fat, 11; milk sugar, 10.06; cane sugar, 37.46; ash, 2; and water, 27.62 per cent.

A so-called whole-milk powder showed the following composition: Nitrogenous substances, 17.56; fat, 22.9; milk sugar, 20.83; cane sugar, 28.77; ash, 5.90; and water 4.04 per cent was believed to have been prepared from skim milk. The average

composition of 3 samples of skim-milk powder was as follows: Nitrogenous substances, 37.59; fat, 0.72; milk sugar, 45.83; ash, 8.75; other nonnitrogenous substances 1.12; and water, 5.99 per cent.

The relative profits of selling milk, cream, and butter, C. F. DOANE (*Maryland Sta. Bul. 97, pp. 45-56*).—This is a discussion of the relative profits from the different lines of dairying pursued in Maryland, and is based upon data collected by the author and presented in the bulletin. While considerable butter is made on the farm and in creameries, the production of milk and cream for the city trade is the most important line of dairying in the State.

Means and expenses of transportation, the matter of labor involved in selling milk and in butter making, the value of the skim milk, the relative advantages of winter and summer dairying, the prices received for dairy products at different times of the year, special local conditions, and other topics are considered in sufficient detail to enable a dairyman to decide for himself upon the most profitable line to pursue under his own local conditions.

Facts concerning the history, commerce, and manufacture of butter, H. HAYWARD (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 177-200; Circ. 56, pp. 177-200*).—Considerable information is summarized in this article, the scope of which may be indicated by the subheadings: The uses of butter in ancient times, present status of the butter industry, butter as a food, physical and chemical qualities of butter, butter faults, pasteurized-cream butter, composition of butter, the yield of butter, judging butter, butter substitutes, adulterations of butter, home tests for butter, the cost of butter, prices for butter, distribution of butter, deterioration of butter, care of butter, and butter laws.

Concluding suggestions are given concerning cleanliness, regularity in attention to the details of dairy work, control of temperature, and the proper ripening of cream, which are considered as essential for the successful making of butter in dairies.

On the composition of butter from different dairies, J. SIEDEL (*Molk. Ztg., 18 (1904), No. 51, pp. 1221-1224*).—During a period of 5 years the author made examinations of salted butter from 10 creameries. Two examinations were made in the winter and 2 in the summer. Detailed data are tabulated.

The summer butter from the 10 dairies showed an average water content varying from 11.16 to 13.73 per cent; proteids, 0.46 to 0.62 per cent; milk sugar, 0.36 to 0.60 per cent; salt, 0.85 to 1.42 per cent; a Reichert-Meissl number from 25.29 to 27.56; and an iodin number from 36.97 to 41.57. The winter butter showed the following variations in composition: Water, 11.49 to 13.87 per cent; proteids, 0.52 to 0.86 per cent; milk sugar, 0.47 to 0.73 per cent; salt, 0.91 to 1.83 per cent; a Reichert-Meissl number from 29.19 to 30.92; and an iodin number from 27.45 to 30.86.

The lowest water content was 8.88 per cent and the highest 15.13 per cent. No constant relation of the percentage of water, proteids, milk sugar, and salt was observed.

Bacteriological and chemical studies of the butter in the Province of Posen with especial reference to the tubercle bacillus, TEICHERT (*Inaug. Diss., Univ. Jena, 1904; abs. in Centbl. Bakt. u. Par., 2. Abt., 13 (1904), No. 18, pp. 560, 561*).—Forty samples of butter, from 36 different dairies situated in different parts of the province, were examined. The bacterial content of the samples varied from 541,176 to 22,010,600 per gram of butter.

The bacterial content was found to increase at first during storage and then gradually to decrease. In butter stored for a long time, nearly pure cultures of yeasts were obtained in some cases. Lactic-acid bacteria, wild yeasts, *Oidium lactis*, and *Penicillium glaucum* were usually present in the butter. *Mucor mucedo* was occasionally found. The author isolated 2 new micro-organisms to which the names *Micrococcus butyri fluorescens* and *Bacillus butyri bruneus* were given. Morphological and cultural characteristics of these organisms are reported. Investigations were made

to determine the relation of the micro-organisms which were isolated and the changes taking place in butter, especially in the proteids.

In butter from 8 of the 36 creameries was the presence of tubercle bacilli positively determined, while in 3 other instances their presence was suspected. The investigations indicate that in salted butter made from ripened cream the tubercle bacilli lose their virulence for guinea pigs after about 3 weeks. Chemical analyses of the samples of butter are reported and a bibliography is included.

The proportion of non-butter in normal butter. The fraudulent incorporation of water, M. Marcas (*Rev. Gén. Lait, 3 (1904), No. 20, pp. 457–462*).—On the basis of analyses of butter made in Belgium and on the results of experiments to determine the influence of the acidity of cream, temperature and degree of churning, washing and salting butter, and the pasteurization of cream upon the composition of the butter, the author concludes that under ordinary conditions the proportion of constituents other than fat exceeds 18 per cent only exceptionally, and that such an excess should be considered as a fraud.

Butter production and butter control in the Netherlands (*Molk. Ztg., 18 (1904), Nos. 52, pp. 1243–1245; 53, pp. 1269–1271*).—This article, which is taken from a government report of Holland, gives statistics on the dairy industry in the different provinces.

Netherland cheese (*Verslag. en Meded. Afdeel. Landb. Dept. Waterst., Hand., Nijr., 1904, No. 5, pp. 111*).—A statistical report on the importation of cheese by various countries of the world, with special reference to the cheese production of Holland.

Creameries and cheese factories, their organization, building, and equipment, W. J. Elliott (*Montana Sta. Bul. 53, pp. 59–88, figs. 6*).—Notes are given on dairying in Montana, suggestions are made concerning the organization of creamery and cheese factory companies, and plans and specifications for the construction of creameries and cheese factories with complete lists of machinery necessary for both are included.

Experiments in making cheese from pasteurized milk, G. Fascetti (*Abs. in Milch Ztg., 33 (1904), No. 49, p. 774*).—Stracchino cheese was made from pasteurized milk by the use of a solution of calcium chlorid to restore the consistency of the skim milk and the addition of an extract of a normal half-ripened cheese to secure the ripening of the cheese. Six experiments were made.

At the end of 30 days, cheese made from pasteurized milk had not reached the same degree of ripeness as cheese made from raw milk. Cheese made from the pasteurized milk was, nevertheless, materially improved by the use of the extract, by which means it is believed possible to produce good cheese from pasteurized milk. The pasteurization increased the yield of the cheese.

On the presence of acid and rennet producing bacteria in cheese during ripening, C. Gorini (*Rev. Gén. Lait, 3 (1904), Nos. 22, pp. 505–510; 24, pp. 560–562*).—The presence in milk of bacteria capable of peptonizing casein in an acid medium has been noted by the author in earlier publications. In the present article he reports the presence of such bacteria in cheese during advanced stages of ripening. From an Emmenthal cheese 40 days old, a motile, sporogeneous, facultative anaerobic bacillus, 8 to 10μ in length, staining by Gram's method and growing on all ordinary media, was isolated. The author proposes for the bacillus the name *Bacillus acidificans presamigenes casei* in order to distinguish it from the ordinary peptonizing or Tyrothrix forms.

For practical purposes the author would classify the bacteria of milk as follows: (1) Ferments of lactose—true lactic-acid bacteria which acidify milk without peptonizing it; (2) ferments of casein—bacteria which peptonize milk without acidifying it, and (3) ferments of lactose and of casein—bacteria producing acid and rennet

which acidify and peptonize milk. To the last class belong the cocci previously isolated by the author and the bacillus noted above.

The presence of anaerobic bacteria in normal milk and their relation to the ripening of cheese, A. Rodella (*Centbl. Bakt. u. Par., 2. Abt., 13 (1904), Nos. 16–17, pp. 504–513; 19–20, pp. 589–604*).—The greater part of this article is devoted to a description of methods for isolating and growing anaerobic bacteria. In earlier articles the author has shown that anaerobic bacteria of the butyric-acid type are present in cheese. In the present articles he reports that such bacteria are regularly present in 0.1 cc. samples of milk from which he concludes that in 1 gm. of cheese their number must exceed 100.

The regular occurrence of anaerobic bacteria in cheese, and the fact that such bacteria are capable of producing from casein and other proteids a cheese-like odor, are advanced by the author in support of his view that anaerobic bacteria take part in the ripening of Emmenthal and other kinds of cheese.

Biological studies of the cheese-ripening process with special reference to the volatile fatty acids, O. Jensen (*Landw. Jahrb. Schweiz, 18 (1904), No. 8, pp. 319–405; Ann. Agr. Suisse, 5 (1904), No. 7, pp. 229–326; Centbl. Bakt. u. Par., 2. Abt., 13 (1904), Nos. 5–7, pp. 161–170; 9–11, pp. 291–306; 13–14, pp. 428–439; 16–17, pp. 514–527; 19–20, pp. 604–615; 22–23, pp. 687–705; 24, pp. 753–765*).—The following table summarizes some of the analytical data obtained by the author in his examinations of different kinds of cheese:

Volatile fatty acids in cheese, in grams per kilogram.

Kind of cheese.	From cleavage of fat.		From cleavage of casein or paracasein and lactose or lactic acid.					Total volatile acids.	Ammonia.
	Caproic.	Butyric.	Valeric.	Butyric.	Propionic.	Acetic.	Formic.		
Emmenthal:									
Interior	0.116	0.176	....	....	4.218	1.680	....	6.190	1.275
Exterior	.928	1.232	....	....	2.812	.900	....	5.872	.935
Edam:									
Interior	....	....			.224	.678	0.057	.959	.255
Swiss skim milk:									
Interior	.986	1.496	....	....	2.405	1.200	.138	6.225	4.548
Exterior	1.682	2.552	....	....	2.775	1.080	.046	8.135	3.528
Roquefort:									
Entire mass	.928	1.672	....	....	....	.540	.092	3.232	1.955
Camembert:									
Interior	.081	.246	....	....	....	.069	.082	.478	2.975
Brie:									
Interior	.139	.572	....	....	....	.204	.008	.923	1.615
Exterior	.128	.466	....	....	....	.120	.013	.727	3.698
Romadour:									
Interior	.058	.440	1.581	....	5.180	1.140	.046	8.445	3.409
Exterior	.232	1.003	1.550	....	4.529	.822	.046	8.182	3.740
Glarus sour milk:									
Entire mass	1.195	1.848	....	4.452	9.102	3.198	....	19.795	3.655

The greater portion, at least, of the caproic and butyric acids in rennet cheese is considered as coming from the fat. Acetic acid was present in all the kinds of cheese examined, as was also formic acid, although the quantity of the latter was often too small to determine. As these 2 acids are formed by all the ferments investigated, their origin in cheese is easily explainable. They were present in only small quantities in those kinds of cheese in which molds play the principal rôle in ripening. In all the other kinds of cheese, propionic acid was present and often in such large quantities as to constitute the principal acid.

The origin of so much propionic acid in cheese is not considered clear. While most of the ferments produce propionic acid in cultures, the quantity is always much less than that of acetic acid. In cheese containing large quantities of volatile fatty

acids, the presence of unknown ferments capable of producing a typical propionic-acetic acid fermentation is considered by no means excluded. The existence of such a ferment has been shown by Fitz. Only in brick cheese prepared in the manner of Limburger cheese was valeric acid detected with certainty. Since bacteria, capable of producing this acid, were found in all other kinds of cheese, it is thought probable that valeric acid is invariably present, although in quantities too small to be distinguished from the other acids. The simultaneous presence of different ferments in cheese, of which now one and now another gains supremacy, would explain in the simplest manner, according to the author, the varying relations between the different volatile acids.

The absence of any considerable amount of butyric acid in rennet cheese is explained by the low temperature used in cheese ripening which favors the preponderance of lactic-acid bacteria over butyric-acid ferments. In the sour-milk cheese, in which the lactic-acid bacteria were destroyed, butyric acid was present in large quantities. Capric and caprylic acids were not determined, as these, as a rule, bear a definite relation to caproic acid. To these 3 acids and valeric and butyric acids are attributed the aroma of cheese. Propionic, acetic, and formic acids, unless present in excessive amounts, play no important rôle, as these are seldom present in a free condition but usually in the form of neutral salts.

The formation of ammonia corresponded closely with the rate of cleavage of fat. The quantity of ammonia present was never sufficient to give an alkaline reaction with phenolphthalein, although the soft cheeses, especially the outer layers, reacted often with litmus. The most important constituent of the characteristic aroma of the different kinds of cheese are formic acid for Emmenthal, butyric ester for Roquefort, certain decomposition products for Limburger, and the odoriferous constituents of the clover, used in its manufacture, for the Glarus sour-milk cheese.

Appended to the article proper is a report of some experiments in which the influence of pepsin, combined with rennet and paracasein, was studied. Paracasein was strongly attacked by the pepsin and rennet, but this influence was increased to a marked extent by the presence of *Bacterium lactis acidi* showing that lactic acid is favorable to proteolysis. *Bacillus casei limburgensis*, although possessing an alkaline reaction, did not hinder the action of pepsin when these 2 were used together.

The influence of the different organized and unorganized ferments studied in this work is summarized as follows: *Bacillus casei limburgensis* alone forms only primary albumoses; pepsin, in the presence of lactic-acid ferments, forms also secondary albumoses and peptones; *Micrococcus casei liquefaciens*, *Paraplectrum fœtidum*, and *Bacillus nobilis* form mainly peptones, formic acid, and ammonia. Their proteolytic action decreases in the order mentioned. *Micrococcus casei liquefaciens* in common with *Bacillus casei limburgensis* acts almost the same as *Bacillus nobilis*. *Bacillus casei* α and ε form apparently only formic acid.

It is further noted that the author and E. von Freudenreich, while this article was in press, have succeeded in isolating a propionic acid ferment similar in morphological and cultural characteristics to *Bacterium lactis acidi*.

VETERINARY SCIENCE AND PRACTICE.

The alexins and bactericidal substances of normal serum, Y. PIRENNE (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 5, pp. 723-731*).—The author maintains that there are 2 bactericidal substances in the normal serum of rats essentially different in nature and exhibiting specific characters. One of the substances destroys the anthrax bacillus and other organisms belonging to this group. The second body described as occurring in the rat serum is capable of destroying the cholera vibrio. These bodies are called by the author bactericidal and vibrionicidal, respectively.

Attention is called to the behavior of alexins toward heat, light, and other natural agencies and the effect of this influence upon the 2 bodies in normal rat serum is discussed. As a result of the author's study of these substances it is concluded that neither one possesses the properties usually recognized as characteristic of true alexins.

The relation between the formation of hemolysin and the agglutinability of staphylococci, Kutscher and F. Konrich (*Ztschr. Hyg. u. Infectionskrank., 48 (1904), No. 2, pp. 249–268*).—During the authors' investigations of this problem, 57 races of staphylococci were studied. The origin of the staphylococci and their behavior on various nutrient media are shown in tabular form, together with numerous data regarding agglutination and the formation of hemolysin.

It appears that pathogenic staphylococci may be agglutinated by very dilute solutions of specific sera. In this manner the cultures may be readily identified. Saprophytic staphylococci may also be agglutinated in a similar manner, but not by so minute solutions of the specific sera. Between certain races of staphylococci the power of mutual agglutination exists. True pathogenic staphylococci produce the hemolysin without exception. This power, however, is apparently not possessed by the saprophytic forms.

The hemolytic power of blood serum as compared with that of lymph, F. Battelli (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 5, pp. 199–201*).—In the experiments reported by the author it was found that the hemolytic power of the blood serum in dogs and that of the lymph as obtained from the thoracic duct stood in the ratio of 11 to 7. The lymph obtained from the extremities appears to possess a weaker hemolytic power than that of the duct. The hemolytic alexin apparently comes from the large mononuclear cells. The small lymphocytes either do not produce the alexin at all or only in small quantities.

Invisible micro-organisms, M. Dorset (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 139–156; Circ. 57, pp. 139–156*).—The author discusses the recent results obtained from an investigation of infectious diseases of which the micro-organisms are ultramicroscopic or at any rate unknown. These diseases include foot-and-mouth disease, pleuro-pneumonia, horse sickness of South Africa, bird pest or fowl plague, sheep pox, rinderpest, rabies, epithelioma contagiosum, etc. A bibliography of the subject is appended to the article.

Veterinary notes, Gray et al. (*Rhodesian Agr. Jour., 2 (1904), No. 1, pp. 8–18*).—Brief notes are given on the present status of the problem of African coast fever. Dr. Koch's method of immunization against this disease has proved unsatisfactory in practice, and the author recommends, therefore, that more attention be given to suspension of the movements of cattle so far as possible, fencing, and systematic dipping.

Notes are presented on the symptoms, pathological anatomy, and treatment of biliary fever in horses. At the recent intercolonial veterinary conference at which the different South African colonies were represented, resolutions were adopted regarding the treatment of African coast fever, Texas fever, tuberculosis, glanders, hog cholera, foot-and-mouth disease, sheep scab, anthrax, etc.

A conference of delegates from various farmers' associations met at Salisbury, June 11, 1904, to discuss the question of suspending all cattle movements for a period of 12 months for the purpose of eradicating African coast fever. The resolution finally adopted declares that any measure instituted for the purpose of eradicating this disease should not be made applicable to Rhodesia as a whole, but should vary for the different fiscal districts.

Abortion, M. H. Reynolds (*Amer. Vet. Rev., 27 (1904), No. 11, pp. 1062–1070*).—The author undertook the collection of statistics regarding the conditions which predispose to this disease in cows and also regarding the symptoms and course of the

disease. Some dairymen reported that they had never had cases, while others had suffered severely from this disease.

According to the statistics collected by the author, 4 general causes of abortion may be recognized, bacterial infection, poor physical condition of the animals, objectionable feeding stuffs or material in drinking water, and injuries. Particular attention is given to a discussion of the proper methods for preventing and eradicating infectious abortion. During this discussion the Bang method is described in detail.

Azoturia, G. E. CORWIN (*Amer. Vet. Rev., 27 (1904), No. 11, pp. 1071-1073*).—On account of the uncertainty which prevails regarding the etiology of this disease the author devoted some attention to determining the symptoms, course, and treatment. It is believed by the author to be unwise to administer purgatives. Good results were obtained from the alternate use of potassium iodid and potassium bromid together with enemas with warm water.

Intravenous injections, W. F. SYKES (*Amer. Vet. Rev., 27 (1904), No. 11, pp. 1054-1061, figs. 2*).—The technique of making intravenous injections in the treatment of domesticated animals is discussed in considerable detail, and suggestions were made regarding the necessary apparatus and the methods to be adopted in a number of diseases.

It is believed by the author that the opportunities for making intravenous injections will be taken advantage of more frequently as the method becomes more familiar to the practicing veterinarian and as the beneficial and speedy results from such treatment become better known.

Physiology, pathology, bacteriology, anatomy, dictionary, W. A. EVANS ET AL. (*The practical medicine series of yearbooks, IX. Chicago: Yearbook Publishers, 1904, pp. 228, figs. 23*).—This volume, while largely devoted to human medicine and the infectious diseases of man, contains brief accounts of recent work in the study of pathogenic bacteria of animal diseases, pathological anatomy, and a list of medical terms which have been introduced since 1901. The recent work relating to the controversy concerning human and bovine tuberculosis is briefly discussed.

Special report on diseases of cattle (*U. S. Dept. Agr., Bureau of Animal Industry, 1904, rev. ed., pp. 533, pls. 52, figs. 12*).—The present revised edition is considerably larger than the old edition published in 1892. All of the articles contained in the old edition have been revised and brought down to date with the exception of the article on feeding cattle, which has been omitted from the new edition. Several new articles have been added, including those on animal parasites and mycotic stomatitis in cattle. The discussion of milk fever has also been revised so as to include the latest treatment of this disease by means of air.

The report contains the following articles: Administration of Medicines, L. Pearson; Diseases of the Digestive Organs, A. J. Murray; Poisons and Poisoning, V. T. Atkinson; Diseases of the Heart, Blood Vessels, and Lymphatics, L. Pearson; Non-Contagious Diseases of the Organs of Respiration, W. H. Lowe; Diseases of the Nervous System, W. H. Harbaugh; Diseases of the Urinary Organs, J. Law; Diseases of the Generative Organs, J. Law; Diseases Following Parturition, J. Law; Diseases of Young Calves, J. Law; Bones: Diseases and Accidents, V. T. Atkinson; Surgical Operations, W. Dickson; Tumors Affecting Cattle, J. R. Mohler; Diseases of the Skin, M. R. Trumbower; Diseases of the Foot, M. R. Trumbower; Diseases of the Eye and its Appendages, M. R. Trumbower; Diseases of the Ear, M. R. Trumbower; Infectious Diseases of Cattle, D. E. Salmon and T. Smith; The Animal Parasites of Cattle, C. W. Stiles; Mycotic Stomatitis in Cattle, J. R. Mohler.

Some observations on the tuberculosis of animals, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 69-88*).—The author believes that there are two questions of supreme importance relative to animal tuberculosis, viz, the

intertransmissibility of the disease between man and animals and the frequency of such transmission. These questions are discussed in a careful manner with numerous references to the literature of this subject.

It is concluded that there is "one tubercle bacillus with infinite variations according to its habitat, whether that habitat is an artificial culture medium or an animal organism, and notwithstanding these variations a bacillus which is always essentially the same, and one which may at any time, if given suitable conditions, retrace its steps and recover the properties which it possessed before the variations occurred." A brief bibliography relating to this subject is appended to the article.

Spread of tuberculosis among healthy cattle upon exposure to tuberculous cattle, E. C. SCHROEDER and W. E. COTTON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 61–68*).—The investigations reported in this paper indicate that all of a herd of cattle may become tuberculous within a year from exposure to one tuberculous animal. The authors describe the arrangement of stalls in a stable in which 7 healthy cattle were kept along with 3 tuberculous cows. Guinea pigs fed milk of a tuberculous cow did not develop the disease. After receiving intraabdominal injections of milk from this cow, however, 2 guinea pigs died of generalized tuberculosis while the third was unaffected.

Detailed notes are given on the history of each animal belonging to the herd. An examination of the records of this herd shows that all of the 7 healthy animals became affected within a little more than 6 months after exposure, with the possible exception of one animal which had received 5 intravenous injections of human tubercle bacilli. This cow was subsequently killed and numerous minute tubercles all of the same age were found in the lungs. These tubercles were believed to be the result of inoculation with human tubercle bacilli. The animal apparently possessed considerable immunity to further infection. Since, however, the lesions in the lungs still contained living tubercle bacilli 10 months after the last injection was made, this fact is considered as furnishing a serious objection to this method of immunization.

Among the healthy animals 2 had received injections of dead tubercle bacilli, one of human and the other of bovine origin. These injections had no influence in the production of immunity. Attention is called to the fact that 5 of the 7 originally healthy cattle showed lesions in the mediastinal glands, 3 in the bronchial glands, 4 in the lungs, 2 in the throat glands, 2 in the mesenteric glands, 1 in the liver, and 2 on the pulmonary surfaces.

It appears, therefore, that stable infection of cattle takes place more commonly through the respired air than through the food. Among 100 guinea pigs which were kept exposed to the tuberculous cattle only one became affected with tuberculosis, and 3 cats which were exposed and received milk from tuberculous cows remained healthy.

A test of the immunity of treated cattle against a natural exposure to tuberculosis, E. A. DE SCHWEINITZ and E. C. SCHROEDER (*Amer. Vet. Rev., 27 (1904), No. 10, pp. 961, 962*).—In 1902 a cow was given intravenous injections in doses of 10 cc. of a moderately virulent culture of human tubercle bacilli which had been maintained in the laboratory for a large number of generations. The culture was no longer virulent for cattle, but had still retained its virulence for guinea pigs.

During the following year the cow was placed in a stall together with tuberculous animals and was repeatedly tested with tuberculin without reaction, after which, in August, 1903, it was killed and examined. The lung was found to be sprinkled with small white nodules, but the other organs and glands showed no tuberculous lesions. The cow treated with human tubercle bacilli appeared to have acquired immunity against the bovine form of the disease. The tubercle bacilli of human origin, however, remained alive for a long period, and the author suggests that "the practicability

of such a method as applied to animals that are to be used as food or for the purpose of producing milk is questionable." The immunizing method, however, may be used to advantage in treating breeding animals.

The early diagnosis of tuberculosis by means of tuberculin, J. DE CHRISTMAS (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 6, pp. 239–241*).—The experiments of the author seem to indicate that tubercle bacillus may produce other toxins than tuberculin, but it is not believed necessary to adopt the method of Mamorek with regard to this point. The author does not believe that it is necessary to assume an excessive secretion of the toxin in order to understand the phenomenon of precocious reaction to tuberculin.

In experiments carried out by the author it was found possible to obtain definite data regarding the nature of suspected fluids by inoculation of guinea pigs. It was not necessary to wait longer than a few weeks to obtain pronounced glandular swellings or characteristic ulcerations if the fluids contain tubercle bacilli. The method preferred by the author in making a rapid diagnosis for tuberculosis will be outlined in subsequent articles.

The vaccinating nuclein secreted by the tubercle bacillus, E. WAHLEN (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 6, p. 237*).—The author has already called attention to the possibility of a spontaneous vaccination during the course of tuberculosis, and it is believed that the vaccination is due to a diffusable substance which is secreted generally in the liquid of the cultures.

The spontaneous vaccination appears to take place very rapidly immediately after inoculation, but its effects begin to disappear to some extent within a few hours. A substance was isolated from fluids containing tubercle bacilli and when freshly precipitated was found to be insoluble in water and salt solution. It is not coagulated by boiling and appears to belong to the group of nucleo-albumins.

The vaccinating power of certain filtered cultures of tubercle bacilli, E. WAHLEN (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 4, pp. 156, 157*).—If tubercle bacilli which are capable of producing a spontaneously vaccinating tuberculosis in animals be cultivated outside of the animal organism, the same property is found to persist in the filtered cultures. This specific action of the filtered cultures varies extremely, according to the origin of the cultures and the filters used in the experiment. It was found possible to obtain cultures which did not produce any ulceration at the point of inoculation in guinea pigs even after a period of 1 month.

Spontaneous vaccination during the course of tuberculosis, E. WAHLEN (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 2, p. 63*).—The author found that if guinea pigs were inoculated with mildly virulent tubercle bacilli of human origin, the first outbreak of the disease was of short duration and was followed by a considerable period of comparative inactivity of the bacillus. As a rule, however, the disease proceeds again on its course of generalization.

During the period of inactivity of the tubercle bacillus the author believes that a natural process of vaccination is manifesting itself, but that under ordinary conditions this is not sufficient to protect the animal from further development of the disease.

The transmission of agglutinating power from the mother to the fetus during experimental tuberculosis, E. HAWTHORN (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 3, pp. 127, 128*).—The observations reported in this paper were made on the offspring of 11 guinea pigs artificially inoculated with tubercle bacilli of varying virulence. It is found that the agglutinating power for homogeneous cultures of tubercle bacilli is almost always transmitted from the mother to the fetus. In one-third of the cases this power was as marked in the fetus as in the mother and was found to persist for a long time. No diminution was noted at the age of 6 months. No tuberculous lesions were found in any of the offspring of the inoculated guinea pigs.

The comparative agglutination of homogeneous cultures of human and bovine tubercle bacilli by the sera obtained after inoculation with these cultures, S. Arloing and P. Courmont (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 10, pp. 454, 455*).—The authors inoculated a number of dogs with homogeneous tubercle cultures in glycerin bouillon and the serum obtained from inoculated dogs was used for the purpose of determining its effects upon cultures of the bacilli.

All cultures were agglutinated in varying degrees, even those which did not themselves produce an agglutinating serum in inoculated animals. Two of the cultures of human tubercle bacilli were not agglutinated. Some of the human and bovine tubercle cultures were reciprocally agglutinable and produced reciprocal agglutinating substances in the serum. There appeared to be greater differences between the tubercle bacilli of human and bovine origin than between different cultures of human origin.

A chemical examination of various tubercle bacilli, E. A. de Schweinitz and M. Dorset (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 99–105; Circ. 52, pp. 99–105*).—A chemical study was made of an attenuated bacillus of human origin, a virulent bacillus of man, a virulent bovine bacillus, a swine bacillus, a bacillus obtained from horses, and an avian bacillus.

These bacilli of different origin were cultivated on a uniform medium and when analyzed had been growing from 2 to 4 months at a temperature of from 37 to 38° C. They were dried at a temperature of 60° C., after which dried bacilli were extracted with hot ether, hot alcohol, and hot chloroform. The analytical data thus obtained were presented in a tabular form. The highest percentage of ether extract was obtained from attenuated human tubercle bacilli, followed by horse bacilli, human virulent bacilli, bovine bacilli, avian bacilli, and swine bacilli.

Ash determinations were also made in the various tubercle bacilli in addition to a determination of the phosphoric acid in the ash. The content of phosphoric pentoxid in the human tubercle bacilli was found to be 60 per cent in the virulent cultures and 70 per cent in the attenuated ones. The results thus obtained indicate that there may be a wide variation in the chemical composition of the tubercle bacilli. There may, however, be as great a difference in attenuated and virulent human bacilli as in bacilli of human and bovine origin.

The desirability of phosphates as an addition to culture media for tubercle bacilli, M. Dorset (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 106–108, pls. 2; Circ. 61, pp. 106–108, pls. 2*).—Tubercle bacilli grown on a peptonized bouillon containing 1 per cent sodium chlorid were analyzed and an ash determination was made. The presence of phosphoric acid was noted and this suggested the desirability of adding phosphates to culture media for tubercle bacilli. Several forms of phosphates were used, including basic sodium phosphate, sodium ammonium phosphate, and acid potassium phosphate.

The results obtained from these experiments indicate that the addition of phosphate was desirable in the culture media for these organisms. The addition of sodium chlorid to bouillon has, therefore, been abandoned by the author and 0.5 per cent of acid potassium phosphate is added to the culture media. No change in virulence in cultures has been observed after growth on this medium, and tuberculin prepare. from such cultures is perfectly satisfactory.

Certain variations in the morphology of tubercle bacilli of bovine origin, C. N. McBryde (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 109–113, pls. 2; Circ. 60, pp. 109–113, pls. 2*).—In examining cultures of tubercle bacilli grown on an egg medium an especially luxuriant growth was noticed near the edge of paraffin which had melted and run down on the medium. Narrow streaks of paraffin were purposely run on such culture medium and the phenomenon just noted was observed in these cases.

An examination of bacilli grown in contact with paraffin failed to show that the paraffin tends to give a fixed characteristic to the bovine tubercle bacillus. In tubercle

bacilli obtained from hogs a marked lengthening was observed. Long filamentous forms were found in connection with the bovine bacillus. Among the bacilli in contact with the paraffin there was a simultaneous occurrence of the long forms and the micrococcus forms of tubercle bacilli.

In explaining the observed effect of paraffin it is suggested that the paraffin protects the surface of the egg from evaporation and thus preserves the degree of moisture which is essential to the growth of the bacillus.

Tuberculosis of the bones as related to circulatory and nutritive troubles, N. PÉTROFF (*Ann. Inst. Pasteur, 18 (1904), No. 9, pp. 590–592*).—In order to test the possible connection between tuberculosis of the bones and circulatory or nutritive disturbances, the author carried out a series of experiments on rabbits. In some of these animals the abdominal sympathetic nerve was divided and in others the sciatic nerve and in still others the crural vein was ligated. After such treatment the animals were inoculated with virulent cultures of tubercle bacilli.

Autopsies made on these animals showed that the disease was distributed in a manner which demonstrated that the changes due to operative interferences had not influenced the course of the disease. Attention is called, however, to the fact that osteomyelitis, a disease most common in young animals in a growing condition, affects most frequently the extremities of the longer bones. Tuberculosis also shows a predilection for such locations.

Robert Koch and his critics, D. A. HUGHES (*Amer. Vet. Rev., 27 (1904), Nos. 10, pp. 919–943; 11, pp. 1016–1034*).—The position of Koch with reference to the controversy concerning tuberculosis is outlined in considerable detail for the purpose of showing the gradual changes in opinion which Koch has held during recent years. The reports of commissioners appointed for the purpose of investigating the relations between human and bovine tuberculosis are also discussed, and abstracts are presented of the views of various investigators in France, Great Britain, Germany, the United States, and Canada.

The conclusion is reached as the result of this study of the literature relating to tuberculosis, that there is no unanimity among scientists at the present time in regard to the manner and degree in which human tuberculosis may be transmitted to cattle or the bovine form of the disease to man. Opinions also vary as to the identity of the human bacillus and that of pearl disease. All investigators agree that bovine tuberculosis is a source of danger to nearly all domesticated animals and most scientists believe that the milk and meat of tuberculous animals are dangerous food for man.

Simultaneous inoculation against rinderpest and its dangers, A. THEILER (*Monatsh. Prakt. Tierh., 16 (1904), No. 4–5, pp. 195–204*).—The simultaneous inoculation of cattle with serum or immune blood and the virus of rinderpest has been proposed quite extensively by veterinarians in South Africa. Statistics are presented showing the number of animals thus treated and the percentage of vaccinated animals which have developed Texas fever as a result of vaccination.

The author believes that simultaneous vaccination against rinderpest in a region in which Texas fever and other blood diseases prevail is very dangerous if blood is used as the virus for inoculation. The danger is especially great for animals which are not immune to Texas fever. In practice it is impossible to exclude with certainty the use of blood of animals which are immune to Texas fever. This method of simultaneous vaccination was abandoned in parts of South Africa and as a result of this movement rinderpest has been eradicated from such regions.

Resistance against rinderpest and other infectious diseases conferred by the subcutaneous injection of certain bile products and also by the injection of substances prepared from animal testes and the seeds of plants, A. LINGARD (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 2, pp. 246–248*).—During the author's experiments about 1,550 cattle of various breeds were used. It has already been shown that hill cattle, plain cattle, and hill buffalo exhibit different degrees of

immunity to rinderpest and that plain cattle may be immunized by Koch's bile method while hill cattle can not.

It was found during the author's experiments that a bile precipitate which had been inoculated together with rinderpest blood when washed and dissolved in a 1 per cent solution of carbonate of soda neutralizes the virus of rinderpest blood when exposed for several hours in vitro. It was found that plains cattle could be well protected against subcutaneous injections of virulent blood after receiving subcutaneous injections of normal bile at intervals of a few days for 4 times or by receiving a soda solution of the precipitate obtained from normal cattle bile by the use of Almen's tannin solution.

Similar results were obtained by the use of an aqueous solution extracted from bovine testes, subsequently filtered and precipitated with acetic acid. This precipitate when dissolved in a 1 per cent solution of carbonate of soda did not confer immunity on hill cattle but protected plain cattle successfully. The seeds of a considerable variety of pumpkins grown at high elevation were then ground and a solution prepared, after which a precipitate was obtained by the addition of acetic acid. This precipitate when dissolved in 1 per cent solution of sodium carbonate gave similar results to those obtained by the methods just mentioned.

The agglutination of anthrax bacteria by a specific serum, G. SOBERNHEIM (*Deut. Med. Wchnschr., 30 (1904), No. 41, pp. 1501, 1502*).—The author carried out a series of experiments for the purpose of testing the value of results reported by Carini regarding the agglutination of anthrax bacilli by specific serum in very dilute solutions.

As a result of these experiments the author is unable to recognize a specific agglutinating action of anthrax serum. According to his observations, anthrax bacilli are not regularly agglutinated under the influence of immune serum, and moreover are sometimes agglutinated in quite a pronounced manner by normal serum. The agglutinating power of an anthrax serum appears to vary exceedingly, and this variation is so regular that the agglutination can not be placed in the same category with more definite processes of this sort.

The most weighty argument against Carini's contentions appears to be the fact already cited that normal serum usually possesses the same agglutinating power toward anthrax bacilli as immune serum.

A trypanosoma found in blood of cattle in India, DURRANT and J. D. E. HOLMES (*Jour. Comp. Path. and Ther., 17 (1904), No. 3, pp. 209, 210, pl. 1*).—A species of trypanosoma was discovered during a post-mortem examination of a bull which had been used for experimental purposes. The organism resembled somewhat that described by A. Theiler as affecting cattle in South Africa. No inoculation experiments were possible on account of the decomposed condition of the blood at the time when the trypanosoma was discovered.

Foot-rot of sheep: Its nature, cause, and treatment, J. R. MOHLER and H. J. WASHBURN (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 63, pp. 39, pls. 3, fig. 1*).—Foot-rot is used by the authors as indicating the contagious form of foot-rot due to *Bacillus necrophorus*. The date of the first appearance of this disease in America is not known. The symptoms of the disease are described in detail. Sheep become lame and a purulent process extends under the horny covering of the foot and leads to fistulous passages and other lesions. The bacillus of necrosis has also been found to be the cause of foot-rot in reindeer. Contagion spreads quite rapidly among the various sheep in a herd.

The authors tried an experiment in cultivating the necrosis bacillus and in testing its virulence for sheep and other experimental animals. It was found possible to transmit foot-rot readily from diseased to healthy sheep by the use of mixed cultures as well as by pus obtained from the diseased surface. The experiments in question are described in detail. The organism was found to be pathogenic for sheep when

inoculated hypodermically, but did not cause foot-rot either by this method or when given by feeding. Rabbits and mice were found to be susceptible to the necrosis bacillus, but guinea pigs were refractory.

Foot-rot of sheep is of great economic importance and attention was, therefore, called to the features of the disease by which it can be differentiated from wounds, cutaneous abscesses, foot-and-mouth disease, and other related diseases. The prevention of foot-rot may be brought about by careful management and quarantine. Sheep may be pastured on land that has been previously occupied by diseased sheep provided that one winter's frosts have been allowed to intervene. Buildings and premises, however, should be disinfected.

In treating mild cases, the affected sheep may be made to pass slowly through a trough containing a solution of chlorid of lime at the rate of 1 lb. to 12 qts. of water, or, instead of this, carbolic acid may be used at the rate of 1 part to 30 parts of water. For more advanced cases a solution of copper sulphate at the rate of 4 lbs. to 5 gals. of water may be used, or the diseased tissue may be cut away and the parts washed with a 5 per cent solution of carbolic acid, after which an antiseptic powder consisting of carbolic acid, tannic acid, and alum may be sprinkled on the affected part.

Report of the work against sheep scab in 1903, C. O. GOODPASTURE (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 41–53*).—During the year under report a larger number of inspections of sheep was made than ever before, involving a total of 33,647,563 sheep. In this number 8.98 per cent was found to be infected with scab. While the percentage of infection is thus slightly larger than in previous years, this is due to the fact that the principal work was done in western States where the disease was most prevalent.

The work of eradicating sheep scab is progressing in a very satisfactory manner and the results thus far obtained indicate "that it is only a question of a few more years when the fight against sheep scab will be successfully completed." The effectiveness of various dips during the years 1900 to 1903 ranged from 86 to 98.5 per cent, the highest effectiveness being reached in 1903. The dipping of sheep at private plants is usually more effective than that done at public dipping stations, but the difference is not very pronounced.

When the various dips are compared for the years 1900 to 1903, it is seen that tobacco extract and sulphur has the highest average percentage of efficacy; this is believed to be due, however, to the improper mixing of the lime and sulphur dip during the first year of the test. In 1903 the lime and sulphur dip broke the record of efficacy with 98.5 per cent. This dip also has the highest average efficacy during the last 3 years. It is, therefore, evident that lime and sulphur prepared strictly according to directions is the best dip recognized by the Bureau, while the tobacco extract and sulphur is also satisfactory and is easily prepared.

Swine plague, W. GRIPS (*Fortschr. Vet. Hyg., 2 (1904), Nos. 1, pp. 5–18; 2, pp. 49–73; 3, pp. 82–107; 4, pp. 113–135, figs. 6*).—An elaborate historical review is presented on the subject of swine plague with numerous critical references to the literature of the subject in connection with a bibliography. The author outlines in detail his experiments with hogs of different ages and with small laboratory animals for the purpose of determining the relationship and importance of the organism described by Löffler and Schütz and that described by himself as the cause of swine plague.

The differential diagnosis between swine plague and hog cholera is discussed for the purpose of calling attention to the characteristic lesions of swine plague. The symptoms and lesions of the latter disease are described in great detail in connection with the clinical history of a large number of cases. Cultures were made of the organism described by Löffler and Schütz and also of the Grips bacillus and inoculation tests were carried out with these organisms. In this discussion the author argues that the outbreaks of swine plague and the peculiar distribution of the lesions of the disease can not be readily explained on the basis of Löffler's theories, while

the conditions observed appear to harmonize well with the assumption that Grips bacillus is the cause of the disease.

It is concluded therefore that swine plague is a contagious disease affecting mostly young hogs, and is especially characterized by catarrh and purulent processes. In the author's opinion the Grips bacillus is the cause of the disease and infection takes place chiefly through the mouth. Such infection apparently occurs mostly as the result of the ingestion of infected milk. Löffler's bacillus merely causes acute complications of the normal chronic course of swine plague. According to the author's observations Löffler's bacillus may be found in 50 to 60 per cent of hogs in a healthy condition and varies greatly in the degree of its virulence.

The etiology of swine plague, SCHMIDT (*Fortschr. Vet. Hyg., 2 (1904), No. 5, pp. 137–142*).—As a result of his studies on swine plague, the author concludes that the organism described by Löffler and Schütz under the name *Bacillus suisepticus* has nothing to do with the etiology of the disease. This bacillus is considered as an accessory organism nearly always present and sometimes taking part in the production of a more serious lesion. In the author's opinion the organism may sometimes cause a septicemia, or even an infectious pneumonia, but never epizootic swine plague.

The etiology and means of combating swine plague, R. OSTERTAG (*Berlin. Tierärztl. Wchnschr., 1904, No. 51, pp. 847–858*).—In this paper the author presents a critical review of the investigations and opinions of Grips, Glage, Nieberle, and others regarding this disease. It is argued that the evidence presented in favor of considering Grips bacillus as the cause of swine plague is quite unsatisfactory.

Attention is called to the great economic importance of combating swine plague in a scientific and effective manner. The annual losses from the disease are very great and consequently no mistake should be made in the organization of governmental plans for controlling it.

Problem of swine plague, SCHMIDT (*Fortschr. Vet. Hyg., 2 (1904), No. 8, pp. 220–223*).—The author discusses the diagnosis of swine plague from a bacteriological standpoint. As a result of this study it is concluded that the diagnosis of swine plague can not be reached in a reliable manner on a basis of bacteriological investigations without other aid.

It is possible that the mere demonstration of ovoid bacteria which take stain at either end and are virulent for mice may lead to erroneous conclusions and is, therefore, of little value. It is necessary to remember that Grips bacillus and other organisms may be present. In order to reach a reliable diagnosis it is necessary to consider the method of introduction of the disease, the pathological findings, and the course of infection.

Bacillus pyogenes and its relation to swine plague, H. PÜTZ (*Ztschr. Fleisch- u. Milchhyg., 15 (1904), No. 1, pp. 10, 11*).—Inoculation experiments were carried out with *Bacillus pyogenes*, during which pigs received injections of this organism subcutaneously, intravenously, in the pleura, peritoneum, trachea, alimentary tract, and the lungs. A parallel series of inoculations was also made with *B. suisepticus*. From these experiments it is concluded that the latter organism is the true cause of swine plague, while the first-named bacillus never produces the effects ascribed to it by Grips.

Chronic diseases of the udder in hogs, ZANDERS (*Monatsh. Prakt. Tierh., 15 (1904), No. 12, pp. 529–552, pls. 2*).—The literature relating to this subject is discussed in a critical manner. The author had occasion to study 64 cases of chronic diseases in the swine udder. These cases were obtained during the practice of meat inspection. Of 64 cases 2 were identified as atheroma, 4 as tuberculosis, 1 as chronic fibrous mastitis, 6 as chronic purulent mastitis, and 51, or 80 per cent, as actinomycosis.

Detailed notes are given on the gross and microscopic anatomy observed in the different diseases which the author studied in the swine udder. The 4 cases of mammary tuberculosis observed in hogs were due to the generalization of the disease as a result of the translocation of the bacteria through the circulating blood. The chief contingent of the mammary diseases in hogs is actinomycosis, and this is explained as due to the unusually frequent opportunities offered for the organism of actinomycosis to enter hogs through skin wounds.

Mal de caderas in domesticated and wild animals, M. ELMASSIAN and E. MIGONE (*Ann. Inst. Pasteur, 18 (1904), No. 9, pp. 587–589*).—On a cattle ranch in Paraguay badly infested with capibaras, hunting expeditions were organized for the purpose of destroying these pests. It was noted, however, that on every occasion of this sort the dogs which killed and ate the capibaras became affected with mal de caderas and died.

The same disease broke out also among the horses used for hunting. Laboratory experiments and miscroscopic tests showed the presence of the blood parasite of mal de caderas in all cases. It appears, therefore, that the capibara is frequently infected with the organism of mal de caderas, and is capable of transmitting the disease to domesticated animals although itself suffering only a mild form of the disease.

Infectious abortion in horses, P. CRESTA ET AL. (*Bol. Uffic. Min. Agr., Ind. e Com. [Rome], 5 (1904), No. 2, pp. 180–182*).—This is a brief report of a commission appointed for the purpose of investigating this disease. It is recommended that in all cases of abortion the fetus be destroyed and all contaminated objects be disinfected with a 5 per cent solution of corrosive sublimate. Aborting mares should be isolated and subjected to proper antiseptic treatment.

Thrombosis of the posterior aorta and of the iliac arteries in horses, F. SUFFRAN (*Rev. Vét. [Toulouse], 29 (1904), No. 10, pp. 657–664*).—The symptoms of this disease are described and detailed clinical notes are given on the case which came under the author's observations. The disease resulted fatally and pathological lesions as shown at a post-mortem examination are described.

Reports from the Berlin medicinal clinic, E. FRÖHNER (*Monatsh. Prakt. Tierh., 16 (1904), No. 1, pp. 40–47*).—In experiments undertaken for the purpose of testing the value of strophanthin in the treatment of pneumonia of horses it was found that this drug produces a necrosis and is not suitable for use in the treatment of pneumonia either in a pure form or in the form of a tincture. Brief notes are also given on the value of thoracic puncture in the treatment of pneumonia.

Pathological report on a case of rabies in a woman, J. R. MOHLER (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 54–60, pl. 1; Circ. 54, pp. 54–60, pl. 1*).—Notes are given on a case of rabies in a woman who died 21 days after being bitten by a rabid dog. Portions of the medulla oblongata, upper part of the spinal cord, and right plexiform ganglion of the vagus nerve were removed and examined for the presence of the lesions described by Van Gehuchten and Nelis.

The principal change observed was an extensive proliferation of the endothelial cells of the capsule. An infiltration of the leucocytes was also noted. Inoculation experiments were made with an emulsion from the medulla oblongata. All of the rabbits which were inoculated with this material died with typical cases of rabies. The lesions found by a histological examination of the plexiform ganglion of the vagus nerve were such as has been considered typical of rabies.

The passage of rabies virus through Berkefeld filters N and W, P. REMLINGER (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 4, pp. 150, 151*).—The author had already demonstrated that rabies virus may pass through the Berkefeld filter V. In these experiments it is also found to pass through Berkefeld filters N and W. Animals inoculated with filtered virus develop rabies after an incubation period of 10 or 11 days.

Absorption of rabies virus by the pituitary mucous membrane, P. REMLINGER (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 1, pp. 41-43*).—In order to determine the possibility of the absorption of rabies virus through the healthy and uninjured mucous membrane the author placed about 10 drops of an emulsion of fixed rabies virus in the nasal cavities in each of 6 young rabbits. After a period of 7 days the symptoms of rabies began to appear in one rabbit and in all 4 out of 6 rabbits became affected.

These results are considered as showing that the pituitary mucous membrane in a healthy condition is capable of absorbing rabies virus to such an extent as to produce typical cases of rabies.

The virus of exudative typhoid in fowls, A. MAGGIORA and G. L. VALENTI (*Ztschr. Hyg. u. Infectionskrank.. 48* (*1904*), *No. 2, pp. 280-326, pl. 1*).—This disease is held to be identical with cyanolophia of Lode and Gruber, and also with fowl plague of Ostertag.

An elaborate series of experiments was carried on for the purpose of determining the range of the pathogenic power of the organism which causes this disease. A large number of pigeons were inoculated both under ordinary conditions and during periods of fasting. It was found that the organism had no effect upon healthy adult or young pigeons. Pheasants and other related species were tested in the same manner. Pheasants were found to be as susceptible to the disease as common fowls.

Experiments to determine the possible variation in resisting power in fowls of different ages showed that young chickens possess no true immunity toward the disease. Geese proved to be much less susceptible than common fowls. Falcons and hawks, however, were easily infected and developed characteristic symptoms. The blood of falcons infected with this disease was shown to be virulent for common fowls. Dogs were found to be immune and apparently no relationship exists between this disease and similar diseases in cattle.

Experiments were also made to determine whether the virus of the disease could be attenuated so as to be available for the production of immunity. These experiments gave results which are not very encouraging. Better results were obtained from the use of a serum, but the authors propose to study this matter further before coming to definite conclusions regarding the use of serum.

Pulmonary mycosis of birds, with report of a case in a flamingo, J. R. MOHLER and J. S. BUCKLEY (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 122-138, pls. 5; Circ. 58, pp. 122-138, pls. 5*).—An examination was made of a flamingo which died in the National Zoological Park. The bird came from Cuba and was the fourth flamingo to die within three weeks after being imported into this country.

An examination of the flamingo showed that the lungs presented a mottled appearance, the normal pink color being largely replaced by grayish yellow areas the size of a pin head. Similar areas were found in the bronchial tubes. An examination of these areas disclosed *Aspergillus fumigatus*. The symptoms shown by the four flamingos which died in the National Zoological Park were not closely observed. Detailed notes were given on the pathological action of the fungus and on its agency in the production of mycosis in birds.

Experiments were carried out during which chickens, pigeons, rabbits, and guinea pigs were inoculated with the fungus. The greater portion of the experimental animals died as a result of the injection.

A new nematode (Gongylonema ingluvicola) parasitic in the crop of chickens, B. H. RANSOM (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 64, pp. 3, figs. 2*).—In making a post-mortem examination upon a chicken, nematode worms were discovered in burrows in the mucous lining of the crop. These worms upon examination proved to be a new species and are described under the name *Gongylonema ingluvicola*.

Phenolin, E. Bass (*Rev. Vét. [Toulouse], 29 (1904), No. 10, pp. 664–667*).—This product has been used extensively by the author for various purposes. Phenolin is found to be a good disinfectant, capable of producing excellent results in a treatment of wounds and diseases of the reproductive organs. It is also useful in the treatment of skin diseases whether due to animal or vegetable parasites. Phenolin used externally produces no toxic effects and in the author's opinion is preferable to creolin, lysol, etc.

Infectious and contagious diseases of farm animals and their effect on American agriculture, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 163–176*).—The author outlines the effective work of the Bureau of Animal Industry in eradicating pleuro-pneumonia and foot-and-mouth disease in this country. Attention is called to the possibility of the introduction of rinderpest in the United States. Notes are also given on the economic importance of Texas fever, tuberculosis, sheep scab, hog cholera, and blackleg, with an account of the work of the Bureau in combating these diseases.

Contagious diseases of animals in foreign countries, G. F. Thompson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 443–451*).—Statistical data are presented on the prevalence of hog cholera, sheep scab, glanders, anthrax, and other contagious diseases in Great Britain, Denmark, Belgium, France, Switzerland, Netherlands, Germany, Italy, Hungary, India, and Egypt.

TECHNOLOGY.

California olive oil: Its manufacture, G. W. Shaw (*California Sta. Bul. 158, pp. 33, figs. 22*).—This is a discussion of the olive-oil industry of California, in which such subjects as the construction of buildings, equipment and arrangement of machinery, harvesting fruit, crushing and extracting the oil, clarification, filtering, and the use of centrifugal machines for demargarizing oil are discussed. Considerable work along the same line has been reported in earlier bulletins of the station (E. S. R., 11, p. 46; 12, p. 643).

It is not believed that the production of olive oil on a small scale can be made profitable. It promises most success when combined with the olive pickling industry, using the best of the olives for pickling and the smaller and inferior grades for oil. There is a profitable market for only the highest grade of olive oil, and this can be obtained only by the strictest attention to cleanliness and care in every detail of manufacture. Statistics are given which show that the imports of olive oil from foreign countries amount to more than $2,000,000 per year, while the California product amounts to about $150,000 per year.

There is opportunity, therefore, for the growth of the California industry in the production of an oil which will compete in price with the foreign product. For this purpose it is essential that only the most efficient machinery be employed and that the mills be of such capacity as to handle large quantities of olives in the most economical manner. "This can only be done by central mills located in regions best adapted in climate and soil to the growth of the olive." To make the industry successful the grower must realize not less than $20 per ton for the olives over and above the cost of picking, which amounts to $8 to $10 per ton.

Fruit for olive oil should be picked by hand. The best quality of oil is obtained if the fruit is picked "while it is still hard, but sufficiently ripe to allow the pit to be squeezed out without carrying away any of the flesh with it." In the ordinary practice in California only one-third to one-half of the oil contained in the olive is removed by pressing, or from 25 to 40 gal. of oil per ton of olives. At the present time there is but little attempt to utilize the residual oil remaining in the pulp, though the pulp is often used for hog or chicken feed or fuel.

Filtering is not essential to the production of high-grade olive oil, but where it is not employed a considerably longer time is required to obtain a perfect racking. It is believed that one of the errors in the industry is to attempt to bottle the oil too soon. "Where racking alone is depended upon for clarification, oil should not be bottled in a shorter time than 6 months."

Some experiments were made in the centrifugal extraction of oil. An examination of the pressed pulp obtained from different factories within the State indicated that the range of recovery is from 35 to 65 per cent of the oil contained in the olive. With a small centrifugal machine about one-half of the liquid and oil contained in the pulp was extracted during the first 5 minutes, and when the operation was continued from 30 to 45 minutes about 65 per cent of the total amount of oil in the olive was recovered.

In these experiments there was a tendency in the beginning for the oil to collect in the center, which later had to be forced through the pulp on the sides of the machine. It was found desirable to loosen the pulp about every 15 minutes. Most of the oil in the pulp was extracted within 30 minutes. After that the oil obtained was not sufficient to compensate for the loss of time unless the mass was loosened from the screen and moistened with water, when increasing results were secured up to about 1 hour. By loosening the pulp and the use of water 61.3 per cent of the oil still remaining in the mass was recovered, an amount sufficient, it is believed, to be well worth the trouble for the time expended. With a large centrifugal similar results were secured.

"The results taken as a whole and compared with the most effective pressings, and allowance being made for the smaller charges that must be used in the case of the centrifugal as against the large press, can not be considered as offering much encouragement for manufacturers to adopt the former machine for final work, although it might be used for the preliminary treatment in the removal of water of vegetation and a small amount of oil."

The centrifugal was found useful in demargarizing oils. Certain varieties of olives, like the Redding Picholine, carry a large proportion of fatty acids which are extracted with the oil. These crystallize out in the case of this variety at 8 to 9° C. and produce a turbid oil at from 11 to 12° C. With oil from good quality of olives the point of turbidity is 4 to 5° C. and the point of congelation 2 to 3° C. By cooling these fatty oils down very slowly to 6 or 7° C. and then filtering and separating in the centrifugal machine a better grade of oil can be secured.

New process of extracting olive oil, J. A. SMITH (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 287, pp. 113–115*).—This article is largely a translation of a pamphlet by A. Funaro on this subject. The new process is essentially as follows:

"The crushing of the olives in the mill is protracted until a uniform fine pulp is obtained. The pulp is heaped up and the virgin oil which flows from it is collected. The pulp is then passed again through the mill, and afterwards wet with a very dilute solution of carbonate of soda. It is then transferred to a large tank containing alkaline lye and heated to a temperature not exceeding 40° C. (104° F.). If this were exceeded saponification would be brought about. The contents of the tank are kept in agitation by means of a jet of compressed air.

"At the end of 6 hours the contents are allowed to settle, the olive pits, washed quite clean, falling to the bottom, while all the fatty matter and lighter particles of the pulp rise to the surface in a kind of emulsion. The olive pits and alkaline liquor being then withdrawn from the bottom of the tank, there is added to this emulsion a cold dilute solution of alum. The compound is again agitated by means of compressed air, and an electrical current is passed through it during some hours.

"It is then allowed to settle for a few hours. The resinous matter present, combining with the alum, is precipitated, carrying with it all the solids, while the oil rises to the surface nearly free from extraneous matter and is rendered quite bright and limpid by filtering. The aluminous compound which, as has been stated, falls to the bottom of the tank contains not more than 4 to 5 parts in 100, by weight, of fatty matter, after evaporation of moisture. This small percentage can be recovered by the sulphid process, or if the residuum be heated up, after the addition of soda, soap stock is obtained."

In experimenting with the new process of extraction the olives treated contained 26.85 per cent of fatty matter, 39.75 per cent of water, and 33.40 per cent of cellular substance. The yield of oil obtained was 25.15 per cent, and an additional 1 per cent of oil was recovered after a short interval from the residue. Similar olives treated in the customary manner of crushing and pressing gave 19.25 per cent of oil from the first and second pressings, and 4.40 per cent from the depositing tanks and by washing, making a total of 23.65 per cent. Similar trials conducted at another place gave 22.6 per cent of pressed oil and 1.2 per cent of washed oil, total 23.8 per cent.

By the new process of oil extraction the working expenses are reduced because of the elimination of presses, pumps, mats, bags, etc. Five laborers and one mechanic were found adequate for the handling of 11,000 lbs. of olives daily. Oil thus produced is of a pale straw color and of hardly any odor. It neither congeals nor solidifies as rapidly as olive oils made in the usual manner. It is free from acids and remains so for a year or longer, even when exposed to the air. It is without the flavor of fruit, which characterizes olive oils made in the usual way.

A large commercial firm to whom a sample of the oil obtained by the new process was submitted for examination reported that it had entirely lost its natural flavor of olive oil and acquired instead an unpleasant and rather nauseous taste. The neutral character of the oil might make it of value for industrial purposes. It is believed that the new process will not lend itself to the production of olive oils of the finest grade. It may be of value, however, in the rapid and economical treatment of the residues as they leave the oil press.

Calculations used in cane-sugar factories, I. H. MORSE (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. VIII+74*).—"A practical system of chemical control for Louisiana sugar houses and other cane-producing countries."

Handbook for the use of the sugar-beet grower and the beet-sugar manufacturer of Java, N. A. P. M. TERVOOREN (*Handboek ten dienste van de suikerrietcultuur en de rietsuiker-fabricage op Java. Amsterdam: J. H. de Bussy, 1904, pp. XVI+296, figs. 35*).

Agricultural technology: Sugar making, milling, packing, and starch making, E. SAILLARD (*Technologie agricole: sucrerie, meunerie, boulangerie, féculerie, amidonnerie. Paris: J. Baillière & Sons; rev. in Ingén. Agr. Gembloux, 14 (1904), No. 8, pp. 373, 374*).—This volume is encyclopedic in character.

The textile fibers: Their physical, microscopical, and chemical properties, J. M. MATTHEWS (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. VI+288, figs. 69*).—This work on textile chemistry is intended for the practical operator in textiles and the student on textile subjects. Wool and hair fibers, silk, cotton, linen, jute, ramie, hemp, and minor vegetable fibers, such as New Zealand flax, Manila hemp, sisal hemp, etc., are discussed. The more important fibers are treated at some length. The qualitative and quantitative analysis of textile fibers is considered, a chapter being devoted to each subject. A bibliography covering the field of the book is given.

AGRICULTURAL ENGINEERING.

Report of drainage commission, G. A. RALPH (*Irrig. Age, 20 (1905), No. 3, p. 78*).—In the report of the chief engineer of the State Drainage Commission of Minnesota it is stated that $100,000 has been expended by the State in construction of drainage ditches which have benefited 370,860 acres of land. There are 24 ditches with a total length of 88.78 miles.

"The benefits resulting from the construction of these ditches have been much greater than the original estimates show. Lost River ditch, in Polk and Beltrami counties, 3.7 miles long, has transformed an impassable bog of several thousand acres into rich meadow and tillable land. Badger and Skunk creeks, in Roseau County, 8.5 miles long, will afford an outlet for a drainage system covering upward of 50 square miles, and has made salable thousands of acres of land at prices averaging $8 an acre, which prior to the construction of the ditches had no market value."

Contributions to the hydrology of eastern United States, 1903, M. L. FULLER (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 102, pp. 522*).—This is "a statistical progress report covering hydrologic work done in eastern United States during the year indicated. The report contains a list of such publications of the Survey as relate to hydrology, an account of the work of the eastern section of the division of hydrology for 1903, and 27 contributions, by 23 geologists, presenting extended notes on the wells, springs, and general water resources of 17 States."

A review of the laws forbidding pollution of inland waters in the United States, E. B. GOODELL (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 103, pp. 120*).—This review contains (1) a summary of the common law upon the subject of water pollution—i. e., the law as pronounced and determined by the courts independently of legislative action—and (2) a summary or abstract of the statutes enacted by the various legislatures aimed at the correction of the evil.

Report on irrigation investigations in humid sections of the United States in 1903 (*U. S. Dept. Agr., Office of Experiment Stations Bul. 148, pp. 45, pls. 3*).—This report contains descriptions of irrigation plants in use on market gardens near New York City, on Long Island, and in New Jersey, and accounts of experiments at the New Jersey Station in irrigating asparagus and small fruits, by E. B. Voorhees; of experiments at the Missouri Station in irrigating strawberries, asparagus, nursery stock, onions, and corn, by H. J. Waters; and of the history, present status, and possibilities of irrigation in the artesian basin of South Dakota, by A. B. Crane.

The bulletin as a whole shows the great advantage of irrigation as a means of increasing production and as an insurance against drought even where the expense of securing a water supply is comparatively large.

Irrigation in the United States, 1902, C. J. BLANCHARD (*U. S. Dept. Com. and Labor, Bureau of the Census Bul. 16, pp. 92*).—This report, which was prepared in compliance with Congressional authorization to the Director of the Census "to complete and bring up to date of the crop year of 1902 the statistics relating to irrigation, the area of land reclaimed, the cost and value of the works, and such other information as can be obtained bearing upon the present condition of irrigation," is based upon statistics secured by correspondence supplemented by field work in a few States, and on information obtained from State engineers and their assistants. The statistics are grouped according to regions—arid, semiarid, rice States, and humid States—drainage basins, and by States and Territories. (Noted editorially.)

Report of progress of stream measurements for the calendar year 1903, J. C. HOYT (*U. S. Geol. Survey; Water Supply and Irrig. Paper No. 100, pp. 533, map 1*).—The territory covered by this paper includes Interior Basin, Pacific, and Hudson Bay drainage. The data reported include measurements made at regular gaging stations, "the results of the computations based upon the observations, and such other

information as has been collected in the various drainage areas that may be of use in hydrographic studies, including, as far as available, a description of the drainage area and the streams draining it."

Report of progress of stream measurements for the calendar year 1903, J. C. Hoyt (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 97, pp. 518, map 1*).—This is part 1 of the annual report on stream measurements and is a partial record of data collected from the territory east of the Mississippi River. The report contains detailed measurements of the flow of streams as well as such other additional information as is of use in general hydrographic studies.

Current wheels, R. A. Farnum (*Irrig. Age, 20 (1905), No. 3, pp. 76, 77, figs. 9*).—A brief illustrated account of the construction and operation of a few forms of current wheels.

Cost of pumping for irrigation, S. M. Woodward (*Arizona Sta. Bul. 49, pp. 437–469*).—This bulletin gives the results of investigations relating to the actual cost of pumping water for irrigation at 10 representative pumping plants now in operation in Arizona, with recommendations and conclusions as to best kinds of pumping machinery and best methods of pumping.

It is stated that "complete pumping plants, not including cost of wells, can be built in reasonably accessible locations in Arizona for approximately $100 per rated horsepower, or $200 per water horsepower. Small plants may exceed this cost, while very large ones will probably fall below. Small plants of 12 rated horsepower or more, under favorable conditions, should lift 1 acre-foot of water 1 ft. in height for 15 cts. or less. Plants of 100 rated horsepower or higher should do the same for about 5 cts."

Tests of irrigation pumping plants and wells in the valley of the Rio Grande, C. S. Slichter (*Engin. News, 52 (1904), No. 26, pp. 580, 581, fig. 1*).—This article gives detailed results of tests of 18 pumping plants used for irrigation and situated in the valley of the Rio Grande in the lower part of New Mexico and the western end of Texas. The data reported and discussed include lift of pumps, and cost and efficiency of electricity and different kinds of fuel (oil, gasoline, and wood).

Development of the underflow, J. J. Vernon (*Irrig. Age, 20 (1905), No. 3, p. 86*).—A brief account of pumping operations at the New Mexico Station. (See E. S. R., 15, p. 195.)

Underground waters of southern Louisiana, with discussions of their uses for water supplies and for rice irrigation, G. D. Harris and M. L. Fuller (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 101, pp. 98, pls. 11, figs. 15*).—The part of this report prepared by Professor Harris "is an elaboration of a portion of an earlier paper published in the reports of the geological survey of Louisiana, and by means of its descriptions and illustrations brings out clearly the nature of the occurrence and the importance of the underground water resources of the region considered."

The part prepared by Mr. Fuller deals with the increased demand for underground water for various purposes, especially in rice irrigation. The development of rice irrigation, the sources of water, the systems in operation, and methods of pumping and applying water are discussed. Many of the main facts of the latter discussion are taken from Bulletin 113 of this Office (E. S. R., 14, p. 507).

Experiments and results in rice irrigation, T. U. Taylor (*Tradesman, 52 (1904), No. 8, pp. 51–53*).—This is a paper read before the National Irrigation Congress at El Paso. It briefly reviews the history and present status of rice irrigation and describes methods in use.

Forestation, irrigation, and storage reservoirs, L. A. Fabre (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 20, pp. 438–447*).—A general summary of information on these subjects as applied to Algerian and Tunisian conditions.

The reclamation service, F. H. Newell (*Pop. Sci. Mo., 66 (1904), No. 2, pp. 107–116, pl. 1, figs. 6*).—The organization and operations of the reclamation service of the U. S. Geological Survey established under the reclamation act of June 17, 1902,

"setting aside the proceeds of the disposal of public lands to be used in survey and construction of irrigation works in the thirteen States and three Territories of the arid region," are briefly described. The nature and extent of the various projects now under consideration are also explained.

Irrigation of mountain pastures in the Cévennes, F. MAIN (*Jour. Agr. Prat., n. ser., 8 (1904), No. 48, pp. 710–712, fig. 1*).—A brief general account is given of irrigation in the mountain valleys of the departments of Lozère and Ardèche.

The development of power-pumping machinery, W. M. BARR (*Engin. Mag., 28 (1905), No. 4, pp. 616–624, figs. 12*).—This is a discussion of the more important principles embodied in modern pumping machinery.

Windmills in foreign countries (*U. S. Dept. Com. and Labor, Spec. Consular Rpts., 31 (1904), pp. 293*).—This is a series of reports by consular officers of the United States on the number, use, efficiency, source of supply, present demand for and possible extension of use of windmills in foreign countries.

Air-lift pumping plant of the Redlands Water Co. (*Engin. Rec., 51 (1905), No. 1, p. 8, figs. 2*).—This plant is briefly described.

An ingenious air-lift pump (*Engin. and Min. Jour., 78 (1904), No. 25, p. 990, fig. 1*).—The principle of construction is briefly described.

The cementing power of road materials, L. W. PAGE and A. S. CUSHMAN (*U. S. Dept. Agr., Bureau of Chemistry Bul. 85, pp. 24, pl. 1, figs. 6*).—"It is the intention in this bulletin to give as concise a description as possible of the investigation and results of tests of the important property of road materials known as cementing power. In the course of many years' investigation of this and allied problems a vast amount of data has been accumulated, but the effort has been made at this time to select only such as are necessary for the presentation and discussion of the subject."

The material is drawn in large part from publications which have already been noted in the Record (E. S. R., 14, p. 540; 15, pp. 95, 826). Some additional tests of the cementing value of road materials from different parts of the country made during the past year are reported, attention being especially called to the wide variation in the quality of road materials in different sections of the country.

Cements, mortars, and concretes, M. S. FALK (*New York: M. C. Clark, 1904, pp. VI+176, pls. 4, figs. 67*).—In this treatise the author attempts to abstract, classify, and summarize all reliable data obtained in investigations on the physical properties of cement and cement mixtures, with special reference to those properties which concern the engineer.

Hauling on country roads, A. BAALSRUD (*Norsk Landmandsblad, 23 (1904), No. 32, pp. 383–386*).—The paper gives the practical results of trials conducted by the state road director of Norway, with a view to determining the energy required to haul wagons having different loads, width of tires, and height of wheels.—F. W. WOLL.

Trap rocks of Palouse region as road material, C. N. LITTLE and W. L. ZEIGLER (*Idaho Sta. Bul. 45, pp. 12, pls. 3*).—This bulletin reports the results of a series of tests of hardness, toughness, and cementing power of 12 samples of trap rocks from the Palouse region of Washington and Idaho. An Olsen standard abrasion machine, driven by a 3 horsepower motor, was used in the tests of hardness and toughness. The cementing power was tested by means of a Fairbanks cement testing machine, but the results in this case were not very satisfactory. The rocks tested were found to vary widely in the qualities essential to good road materials.

Can our farm wagons be improved? BRUTSCHKE (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 51, pp. 315–318, figs. 5*).—Various types of German farm wagons are described and improvements pointed out.

Cotton picking machine (*Shreveport Times, 1904, Dec. 18; abs. in Jour. Soc. Arts, 53 (1905), No. 2721, pp. 189, 190*).—An account is given of what is stated to have been a successful test on a plantation near Shreveport, La., of a cotton picking machine invented by George A. Lowry, of Boston.

History of rural engineering, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 3 (1904), Nos. 1, pp. 129–179, figs. 48; 2, pp. 341–402, figs. 84*).—This paper, dealing with the history of rural engineering in ancient times, is the second of the series, the first dealing with prehistoric engineering works (E. S. R., 15, p. 623). The first part of the article is devoted to rural structures of various kinds—dwelling houses and farmsteads, stables, grain-storage houses, silos, etc. The second part deals with agricultural works and machinery in ancient Egypt.

MISCELLANEOUS.

Twenty-second Annual Report of New York State Station, 1903 (*New York State Sta. Rpt. 1903, pp. 477*).—This contains the organization list of the station; a financial statement for the year ended September 30, 1903; a list of the periodicals received by the station; meteorological records noted elsewhere; a reprint of a station circular on canning peas (E. S. R., 16, p. 79); and reprints of Bulletins 230 to 244 of the station on the following subjects: Some facts about commercial fertilizers in New York State (E. S. R., 14, p. 1058); the relation of carbon dioxid to proteolysis in the ripening of Cheddar cheese (E. S. R., 14, p. 1115); combating the black rot of cabbage by the removal of affected leaves (E. S. R., 15, p. 51); rennet enzym as a factor in cheese ripening (E. S. R., 15, p. 399); experiments in curing cheese at different temperatures (E. S. R., 15, p. 399); two decays of stored apples (E. S. R., 15, p. 375); conditions affecting chemical changes in cheese ripening (E. S. R., 15, p. 400); the rôle of the lactic-acid bacteria in the manufacture and in the early stages of ripening of Cheddar cheese (E. S. R., 15, p. 508); the status of phosphorus in certain food materials and animal by-products, with special reference to the presence of inorganic forms (E. S. R., 15, p. 496); thinning apples (E. S. R., 15, p. 474); inspection of feeding stuffs (E. S. R., 15, p. 497); potato spraying experiments in 1903 (E. S. R., 15, p. 781); importance of mineral matter and the value of grit for chicks (E. S. R., 15, p. 903); spray mixtures and spray machinery (E. S. R., 15, p. 983); and the director's report for 1903 (E. S. R., 15, p. 1025).

Report of the Secretary of Agriculture, 1904, JAMES WILSON (*U. S. Dept. Agr. Rpt. 79, pp. 99*).—This is a general review of the work of the Department during the year, by the Secretary of Agriculture.

Twentieth Annual Report of the Bureau of Animal Industry, 1903 (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1903, pp. 618*).—This includes a report of the chief of the Bureau on the work done during the year; 20 articles abstracted elsewhere in this issue; 7 articles previously noted; miscellaneous information; statistics on the number, value, and loss of farm animals in the United States in 1903, and on the receipts and shipments of live stock; statistics regarding the registered live stock in the United States, December 31, 1903; and the rules and regulations of the Bureau issued in 1903.

The articles previously noted from other sources are as follows: Bovine tuberculosis affecting the public health (E. S. R., 15, p. 512); new facts concerning the etiology of hog cholera (E. S. R., 15, pp. 619, 923); the cold curing of cheese (E. S. R., 15, p. 398); some details of pig management (E. S. R., 16, p. 400); a review of some experimental work in pig feeding (E. S. R., 15, p. 899); information concerning common goats (E. S. R., 15, p. 602); meat on the farm: butchering, keeping, and curing (E. S. R., 15, p. 893). Some of the articles are reprinted in an abridged form. The review of some experimental work in pig feeding is also published as Circular 63 of the Bureau.

The miscellaneous information based mainly upon consular reports consists of brief articles on the following subjects: Horses in Hawaii; the zebrula *v.* the mule; Limousin cattle; free entry of animals for breeding purposes; an ordinance to protect

horse breeders in the Northwest Territories; numbers of live stock in United Kingdom; imports and exports of animals and animal products of Germany; number of animals in India; live stock in Algeria in 1902; prices of fat sheep in Australia; number of sheep in New Zealand in 1903; Argentina wool statistics; consumption of wool in England; wool sales and wool prices in Australia; the wool-combing industry in Bradford, England; sterilization of meat in Belgium; how shoddy is made; injurious effect of German meat-inspection law; decline in Germany's meat imports; new meat-inspection law in Germany; cost of meat in Germany; the object of German meat restrictions; slaughterhouse prices in Germany; increased French duties on cattle and meats; horse meat in Paris; meat statistics in Hawaii; meat-canning factory in Veracruz; Argentina's meat supply; inspection of cattle in Argentina; American pork no longer prohibited in Turkey; meat exports of New Zealand in 1902; butter industry in the Argentine Republic; butter-making machinery in Canada; dairy products of Manitoba in 1903; American and Canadian cheese in England; purification of milk by ozonization; exports of Russian butter and eggs; butter and egg production of Europe; condensed eggs in South Africa; poultry marketed in Manitoba in 1903; egg-laying contest; the biggest incubator; introduction of musk oxen into Norway; ostrich farming in Australia; hides in Java; goatskins in Java; Austrian rice for horse feed in the United States; sheep-feeding plant in Washington; and sweepstakes Angoras.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, Nos. 7, pp. 49–56; 8, pp. 57–64; 8, Sup., pp. 65–72; 9, pp. 73–80*).—These numbers for November and December, 1904, and January, 1905, contain the usual statistical data concerning crops in the United States and foreign countries. No. 7 contains also a report on the tobacco crop by types; No. 8, the annual report of the statistician for the fiscal year ended June 30, 1904; the supplement to No. 8, statistical tables showing the acreage, production, and value of the principal farm crops for 1904, a report on the rice crop of the United States, and a report on the average price of tobacco classified as (1) cigar types, and (2) chewing, smoking, snuff, and export types; and No. 9, the hearing before the committee on agriculture of the House of Representatives in regard to the reports on cotton acreage and production issued by the Department of Agriculture. The committee was of the opinion that such estimates were honestly, intelligently, and as accurately made as possible.

International sugar situation, F. R. RUTTER (*U. S. Dept. Agr., Bureau of Statistics Bul. 30, pp. 98, pls. 4, fig. 1*).—By the terms of the Brussels Convention which took effect September 1, 1903, all government aid granted directly or indirectly to exported sugar was abolished by the principal sugar exporting countries of Europe, Russia excepted. Statistics and other data bearing upon this withdrawal of bounties are presented and discussed in this bulletin.

It is believed that the most obvious effects of the sugar legislation prior to the Brussels Convention were the artificially high prices for sugar obtained in the countries of production and the artificially low prices prevailing in foreign markets. As an illustration of this it is stated that while the average price of refined sugar, during the year ended August 31, 1903, was less than 4 cts. per lb. in the United Kingdom, and only $4\frac{1}{2}$ cts. per lb. in the United States, the price in Germany was $6\frac{1}{4}$ cts. per lb. and in France over 8 cts. per lb. At present sugar brings only 4 cts. per lb. in Germany, 5 cts. in France, and 6 cts. in Austria.

One effect of the Brussels Convention has been to increase the consumption of sugar in Europe. During 1902–3 only 42 per cent of the sugar produced in Germany was consumed at home, while during the year following the Brussels Convention 58 per cent was consumed within the Empire. The most important features in the present sugar situation are believed to be more equal conditions of competition in the world's market between beet sugar and cane sugar, and the increased consumption of sugar in Europe.

NOTES.

Connecticut State Station.—The station forester, Walter Mulford, has resigned to accept a position elsewhere, and Austin F. Hawes has been appointed in his place.

Indiana Station.—The legislature has appropriated $25,000 a year for the station, with $5,000 for the remainder of the present fiscal year. Of this annual appropriation, $5,000 is for feeding work, especially beef production; $5,000 for experiments in crop and soil improvement, and $5,000 for dairying. An advisory committee of three is provided for, composed of representatives of the Corn Growers', Dairymen's, and Live Stock Associations of the State. These associations took a leading part in securing the appropriation.

Kansas College and Station.—Dr. F. S. Shoenleber has been elected professor of veterinary science in the college and veterinarian of the station, and will also be ex officio State veterinarian. Doctor Shoenleber is a graduate of the Iowa State College and of the Chicago Veterinary College. At the time of his election he was dean and professor of anatomy and histology in the McKillup Veterinary College of Chicago.

Kentucky Station.—The new experiment station building has been completed and is now occupied by the station force. The offices and laboratories of the old building have been turned over to the chemical department of the college.

Louisiana Stations.—The office of the director of the stations has been transferred to Baton Rouge. S. E. McClendon, a former graduate of the agricultural course in the university and recently assistant entomologist of the Louisiana Crop Pest Commission, has been succeeded in the latter position by E. S. Hardy, and has accepted the position of assistant director at the Baton Rouge Station.

Maryland Station.—Stewart B. Shaw, a graduate of the Maryland Agricultural College in the class of 1904, who made horticulture his specialty while in college, has been appointed assistant horticulturist of the station.

Michigan College.—Wells Hall, a dormitory accommodating 110 students and containing suites of rooms for two literary societies and two boarding clubs, was totally destroyed by fire early Friday morning, February 10. None of the students were injured, though many had barely time to get out of the building on fire escapes. The loss to the State will be about $20,000.

Mississippi Station.—Two new branch stations have just been established, one at Holly Springs and the other, known as the Yazoo-Mississippi Delta Branch Station, located at Stoneville.

Nebraska Station.—The annual report of the station for the past year contains an excellent concise summary of some of the more prominent results of the station's work since its organization.

Ohio University.—Dr. Carl W. Gay, of the Iowa State College, has been appointed assistant professor of animal husbandry, vice H. S. Arkell, who has resigned to accept a position at the Ontario Agricultural College.

Oklahoma College.—The week's course in stock judging and seed selection, which was offered by the college for the first time this year, was attended by 135 farmers. The course lasted from February 7 to 13, sessions being held from 8.30 a. m. to 10 p. m. Congress has passed an act giving the college title to a school section adjoining the college farm on the west. The farm now comprises 1,000 acres, in which nearly all of the types of soil found in Oklahoma are represented.

Pennsylvania Station.—Thorne M. Carpenter has resigned his position as assistant chemist of the station and assistant in the investigations with the respiration calorim-

eter to accept a similar position in connection with the investigations on human nutrition at Wesleyan University, Middletown, Conn. The vacancy thus caused has been filled by the promotion of N. C. Hamner; and W. A. Smith, a graduate of the college in 1901, has been appointed assistant chemist. J. B. Robb, of the Maryland Agricultural College, who has assisted in the respiration calorimeter investigations during the past three winters, has been temporarily engaged for the same purpose.

South Carolina Station.—Hon. D. K. Norris, one of the life members of the board of trustees, died January 23.

Virginia College and Station.—The new science hall, erected about three years ago, was totally destroyed by fire on the morning of February 23, together with its contents, including valuable apparatus and museum collections. The loss is estimated at $45,000, with only $15,000 insurance on the building. Science Hall contained the electrical, physical, and chemical laboratories of the college and the chemical laboratories of the station.. The origin of the fire is unknown.

Wyoming University and Station.—The second short course in stock judging, attended by about 100 ranchmen, illustrated the interest which the people of the State are taking in the work of the university and station. The legislature has made an appropriation of $2,000 for the next two years for the carrying on of farmers' institutes and short courses in different parts of the State, $2,000 for continuing the fruit experiments at Lander, and $600 to reimburse the station for glandered horses which were killed The act passed several years ago, locating the agricultural college at Lander, but providing no funds for buildings, was repealed, thus settling the controversy over the permanent location of the college and the experiment station.

Irrigation Investigations in Utah.—The State legislature has made an appropriation of $10,000 for a period of two years to enable the experiment station to conduct experiments and demonstrations on the proper use and the needs and requirements of crops for irrigation water, and on the reclamation of water-logged lands. This work is to be carried on in cooperation with the irrigation investigations of this Office, and the appropriation is conditioned on the Department of Agriculture contributing an equal sum for the investigations. The act took effect upon its passage, and plans for the work are being made.

Experiment Station Men not Government Employees.—The question as to whether experiment station men receiving their salary in part or wholly from the Hatch fund are to be regarded as Government employees has been definitely decided in an opinion recently rendered by the Comptroller of the Treasury. The question arose out of the fact that an act passed in 1885 provides that no money appropriated for the Department of Agriculture shall be paid to any person who at the same time is receiving other compensation as an officer or employee of the Government. The matter has been of importance as bearing upon the payment of money to station men on account of cooperative enterprises undertaken with the Department. In ruling upon this point the Comptroller states that as the Hatch Act provides that the experiment stations shall be established under the direction of the agricultural colleges and makes the appropriation to each State, "I think, therefore, that where money is so appropriated to a State to be expended in its discretion for the purposes for which it is appropriated, persons employed by the State and paid therefrom are employees of the State, and that a payment to a person so employed is not compensation paid to him as an officer or employee of the Government."

California Polytechnic School.—According to the first biennial report of this institution the school has made good progress during the past two years in the erection of buildings, and the acquiring of facilities for instruction along agricultural lines. The total enrollment for the first year was 20, and for the second year 52, the latter including 40 boys and 12 girls. Fifteen of the first-year students have returned to the school. Out of the total enrollment, 20 are in the agricultural course, 13 in mechanics, 12 in domestic science, and 7 unassigned.

Handicraft Schools of Hartford.—The announcement of the courses of the school of horticulture at Hartford, Conn., for the present season shows three different courses in gardening, one extending from January 14 to October 1, another of 30 lessons arranged for teachers, and a third of 20 lessons; a course of 20 lessons in floriculture and gardening, and others in botany and nature, hot beds and plant culture, fruit culture and grafting, and soils and plant food. Most of the courses include practical work and demonstrations. Junior courses, including children's school garden courses, are also offered. H. D. Hemenway continues in charge of the school as director.

Nova Scotia College of Agriculture.—This college was formally opened on February 7 with an enrollment of over 50 students. The work this winter will consist wholly of short courses in animal husbandry, agronomy, horticulture, dairying, and poultry raising. The faculty of the college consists of Melville Cumming, principal; F. C. Sears, director of horticulture; F. L. Fuller, manager of the Provincial Farm, and Joseph Landry, in charge of the poultry department. The staff was assisted in the short-course work by specialists from the agricultural department at Ottawa and the college at Guelph. The college is located on the Provincial Farm at Truro, Nova Scotia. A brief description of its establishment and of the new agricultural building just completed was given some time since (E. S. R., 15, p. 530). The regular courses of the college will begin next September.

Grants for Agricultural Education in Great Britain.—The grants made by the board of agriculture and fisheries in aid of agricultural education in the year 1903–4 amounted to $44,620. This amount was distributed among 16 different institutions, including the principal agricultural colleges in England and Wales, as well as several agricultural and dairy schools, and the National Fruit and Cider Institute. Special grants, amounting to $3,152, were also made for experiment and research. The attendance on courses of longer or shorter duration amounted to considerably over one thousand.

Hollesley Colonial College for the Unemployed.—A note in *Mark Lane Express* states that a committee of the London Unemployed Fund has completed the purchase of the old Colonial College estate at Hollesley Bay, Suffolk, and placed it at the disposal of the central committee for three years. This estate covers 1,300 acres, and was laid out some years ago as a training ground for young men who wished to prepare themselves for farming in the colonies. There are buildings capable of accommodating 750 men, besides a complete range of well-equipped farm buildings, a residence for the superintendent, and 23 cottages. The estate is supplied with all kinds of live stock, and the appliances generally are all modern in character and in good order. The central committee will take possession of the estate at once.

The Home Correspondence School.—The Home Correspondence School of Springfield, Mass., which was formerly conducted by The King-Richardson Company, has recently been incorporated under the laws of Massachusetts as a separate institution. The president is Dr. Lewis McLouth, formerly president of the South Dakota Agricultural College, and associated with him on the faculty, among others, are Dr. W. P. Brooks, of the Massachusetts Agricultural College, agriculture; Prof. John Craig, of Cornell University, horticulture and botany; Dr. H. W. Conn, of Wesleyan University, bacteriology and human physiology; Robert S. Northrop, of the Utah Agricultural College, assistant in horticulture and botany, and Sidney B. Haskell, of the Massachusetts Agricultural College, assistant in agriculture.

French Agricultural Budget.—The budget of the French Ministry of Agriculture for the year 1905, as revised by the budget commission, amounts to approximately $8,510,000. The items are as follows: Salaries and expenses of the central administration and miscellaneous expenses, $294,400; assistance to agriculturists for losses from hail, fire, floods, etc., $300,700; subventions to mutual insurance societies, $174,600; agricultural and horticultural education, $752,250; miscellaneous subventions, prizes, rewards, etc., $408,350; bounties for silkworm culture and cultivation

of flax and hemp, $1,256,650; protection of vineyards against phylloxera, $45,600; prevention of fraud in butter and margarine, $28,600; veterinary schools, $216,300; diseases of animals, compensation, etc., $206,600; State horse-breeding establishments, $1,531,150; irrigation, drainage, embankment, etc., $614,500; management of state forests, $2,680,100; total, $8,509,800.

The appropriation for the management of state forests includes an item of $34,000 for the forest schools at Nancy and Barres. There are certain receipts from the educational institutions, such as fees, sale of products, etc., which amounted in 1902 to $148,216, while the receipts from the breeding establishment amounted to $315,000 and the forest revenues to $6,821,000.

Society for Horticultural Science.—The annual meeting of the society was held in Philadelphia December 27, the sessions being presided over by L. H. Bailey, who delivered the presidential address upon the subject, What is Horticulture? (E. S. R., 16, p. 425).

In a paper on The Importance in Seed Growing of Adherence to Distinct and Clearly Defined Varietal Forms, by W. W. Tracy, sr., attention was called to the variable conceptions which different seed growers have in regard to the ideal type of the same variety of vegetable, the seed of which they may severally offer for sale. One grower may select for quality, another for yield, another for forcing, another for uniformity of product, etc. The result is that the same variety offered by different seedsmen lacks greatly in uniformity of product, and these variations increase the longer the variety is in cultivation. As a remedy for the multiplicity of variations now found grouped under a varietal name, the author urged the development of a public sentiment which should demand of the introducers of new varieties of vegetables under a distinct name that they "publish a full and complete description of precisely what in every particular the ideal of that variety should be; and that this ideal should be rigidly adhered to in the growing of seed to be sold under that name." If this were done, it is believed that the number of listed varieties would gradually decrease, while the distinctive characteristics of the remaining sorts would be developed to a higher degree. The paper was rich in illustrative material bearing on the different phases discussed and drawn from the author's many years of experience as a seedsman.

L. C. Corbett read a paper on The Value of Coordinated Variety Tests and How They May Be Secured. In making such tests it was held desirable that the seeds used should have a common origin and have been grown in the place long enough to have become adapted to the local conditions. At the time of introduction to the trade, the variety should be carefully described and type specimens preserved for future comparison. One of the chief obstacles in the way of careful studies of plant variation at the present time is the lack of accurate descriptions. The use of a comprehensive descriptive outline was suggested. Such an outline in the form of a note blank has been devised for each of the fruits and vegetables and used satisfactorily during the past two years. The features of this note blank consist of a printed enumeration of all the attributes and possible variations liable to occur in plants, a series of simple checks and signs being used to indicate comparative degree of the descriptive adjectives used, so that the matter of note taking can be done rapidly and accurately. On the back of the note blank spaced cross lines are printed to aid in drawing the various parts of the plants to a scale. A uniform method of descriptive note taking, it is believed, would enable seedsmen at once to determine whether a so-called novelty was really new or not. It would aid florists and plant breeders to identify varieties, to detect variations, and determine the results of different cultural practices; and it would often facilitate in determining the duration and modifications which take place in varieties.

Carrying out the idea expressed in these two papers, a committee of the society was appointed to consider the question of standardizing descriptive olericultural

methods. The committee was also asked to report upon the matter of a registration bureau where type descriptions of new varieties might be filed.

Prof. J. Craig presented two papers at the meeting, one on The Value of an Orchard Survey, and the other entitled Some Interrogation Points. In the introduction to the former he referred to the skepticism with which practical fruit growers regard the recommendations of scientific men with reference to orchard practices, and attributed this to the very broad conclusions said to be drawn from very limited experimental data. The conclusions which appeal to the practical man must be founded on so broad a basis of experiment as to disarm criticism. He gave some figures showing that sprayed orchards in 1903 yielded 27 bu. more of fruit per acre than unsprayed. Sixty-six sprayed orchards, containing 626.25 acres, yielded 280 bu. per acre, while 107 unsprayed orchards, containing 673 acres, yielded 253 bu. per acre. Again, 8,430 bbl. of sprayed fruit brought an average price of \$2.02 per barrel, while 6,365 bbl. of unsprayed fruit sold for \$1.80 per barrel. The average price per bushel of 110,445 bu. of sprayed fruit was 31.8 cts., while for 96,345 bu. of unsprayed fruit the price was 27.7 cts. These data are sufficiently comprehensive to admit of satisfactory demonstration of the financial value of spraying. Professor Craig concluded with an appeal "for the spending of a certain amount of effort and time in the collecting of facts from the broad field of everyday experience, in addition to the laboratory or plat type of experiments which, as a rule, engrosses the major portion of our attention."

In the second paper Professor Craig suggested a number of problems in horticulture which need to be investigated more thoroughly in order that there may be more complete and reliable information. Some of these problems were the interrelation and affinities of plants, the extent to which annual applications of lime and sulphur mixtures devitalize the tree, the cumulative effect of fungicides, the influence of artificial light in the forcing of flowers and vegetables, the means of securing definite variation in plant breeding, the possibility of establishing affinity rules for guidance in plant breeding, the relations of stock and scion, effect of graftage on the vigor and productiveness of the plant, and the influence of the stock upon the fruit. A long time will be required to answer some of these questions, and it was urged that experiments should be started with a view to continuing them through a long period.

N. E. Hansen described some of the breeding and selection work which he has been carrying on in South Dakota for the purpose of developing a race of fruits suited to the climatic conditions of that region. The work is regarded as of much promise, and has resulted in a number of interesting combinations, such as the peach and the nectarine with the sand cherry, and the latter also with *Prunus simoni*. A good illustrated account of this work was recently published in South Dakota Station Bulletins Nos. 87 and 88 (E. S. R., 16, pp. 369, 370).

In An Experiment on the Selection of Seed Potatoes: Productive *v.* Unproductive Hills, H. J. Eustace presented a record of the results of digging 500 hills of potatoes grown under uniform conditions, and planting the tubers from the 125 heaviest-yielding hills in comparison with those from the 125 lightest-yielding hills. The tubers from the heaviest-yielding hills yielded at the rate of 362 bu. per acre, and from the lightest hills the yields averaged 339 bu. It was expected that the difference in yield would have been greater than the figures indicate. By continuing the selection of seed from the heaviest-yielding hills for a series of years, it was believed that the yield could be considerably increased over that obtained from seed tubers selected at random.

C. P. Close read a paper on Plant Growth by the New Cooper-Hewitt Mercury Vapor Electric Light. Lettuce and radishes were the vegetables used. The bed was kept in entire darkness except for the mercury-vapor electric light. The conditions for growth as regards heat and moisture in the greenhouse were unfavorable during the experiment, and the light was not found to be uniformly satisfactory. This kind

of an electric light is considerably cheaper than the incandescent light. The lettuce grown did not develop normally, but was "drawn" and partook more of the nature of twining plants. Chlorophyll was formed normally in all the plants. With the radishes also chlorophyll was normally developed, but the growth of the plants was exceedingly slow and spindling, and there was not the slightest development of fleshy root on any of the plants used in the test. From the standpoint of the commercial grower the experiment was not a success, but it is believed that under more favorable conditions better results might be secured.

In a paper on Sulphur Washes for Orchard Treatment, P. J. Parrott presented some experimental data to show that sulphur washes have a fungicidal as well as insecticidal value. With apples there was 22 per cent less scabby fruit when a sulphur wash was used on the trees than when all spraying was omitted. One application of sulphur wash with two later applications of Bordeaux-arsenical mixture proved practically as valuable in preventing apple scab and wormy fruit as three applications of Bordeaux-arsenical mixture. The conclusion is drawn from the experiments that "the plan of spraying best adapted for the treatment of apple trees for scale, scab, and codling moth is one application of a sulphur wash during the dormant season, with the usual second and third applications of the Bordeaux-arsenical mixture."

The Horse Bean (*Vicia faba*) as a Cover Crop in Rows, with Notes on Some Other Plants, was the title of a paper by W. T. Macoun. The advantage of horse beans for a cover crop is that they withstand a few degrees of frost, grow late in fall, and stand up during the winter and thus catch and hold the snow. The stalks in spring are readily cut up with a disk harrow, and can easily be incorporated with the soil. The yield was at the rate of 9.75 tons per acre, containing 78 lbs. of nitrogen. This is less nitrogen than that furnished by hairy vetch, but is perhaps sufficient for the trees. It lacked in one important point, viz, a mat of foliage to protect the roots of the trees if there should happen to be no snow to hold. Horse beans and rape were found to make a better combination from this standpoint than horse beans alone.

As bearing upon the question of cover crops, U. P. Hedrick discussed the Relationships of Plants in the Orchard, knowledge of which he showed to be quite deficient. He gave the results of pot experiments with various cover crops grown with seedling peaches, the legumes causing the trees to make a luxuriant growth until frost and thus fail to ripen their wood. The roots of crimson clover and the peach were so intermingled that they were matted together and could not be easily separated. Oats or rye was thought to make a more suitable cover crop for this fruit, since they cause the wood to mature early in the season. A study of the interrelationships of plants was urged.

A Report on the Progress of Horticultural Science in the United Kingdom, 1904, was made by S. Fraser. It covered the work at the Woburn fruit farm with reference to the effect of grass on fruit trees, the varieties of apples most grown in the United Kingdom, the work at the Hadlow Experiment Station on the use of different quantities and combinations of manures and commercial fertilizers for vegetables, potato varieties, etc., nearly all of which have been noted in this journal.

J. B. Norton described some results obtained in the breeding of carnations. The seedlings obtained in his work followed very closely the law of Mendel in regard to hybrids. The seedling flowers were classified into three groups, as single, semidouble, and double. The following data were obtained in one experiment: Doubles, 6; semidoubles, 15; singles, 7; total, 28. In another experiment the figures were as follows: Doubles, 74; semidoubles, 147; singles, 52; total, 273; figures which closely follow Mendel's proportion of 1:2:1. Mr. Norton suggested the advisability of florists crossing the single and extreme double types, rather than always selecting both parents from the standard type. It is believed that by this method there should be a greater proportion of true florists' type of flowers produced.

Prof. L. H. Bailey, of Cornell University, was reelected president of the society, and V. A. Clark, of Arizona, secretary-treasurer, with U. P. Hedrick, of Michigan, assistant secretary. G. B. Brackett, T. V. Munson, and E. J. Wickson were chosen vice-presidents; and W. R. Lazenby (chairman), L. H. Bailey, W. M. Munson, W. L. Howard, and John Craig, members of the executive committee.

Miscellaneous.—Sojiro Yokoyama, chief of the bureau of productive industries of the government of Formosa, who represented his government as commissioner to the Louisiana Purchase Exposition, recently spent several days at this Department on his way home. He reports the establishment in 1903 of an experimental tea factory at Anpeiching, under the directorship of K. Fujiye. Hitherto all tea has been prepared by hand labor, but this method has become very expensive, and the experimental tea factory was established to introduce and test such machinery as is already in use in Ceylon and India, and to devise new machinery adapted to the special conditions prevailing in Formosa. The results already attained indicate that by the use of machinery the cost of producing tea can be reduced about one-half.

In accordance with the general policy of the Japanese Government to reduce the number of government experiment stations and concentrate the work of these institutions at a few centers, the two Formosa experiment stations at Taichiu and Tainan have been abandoned and their work transferred to the station at Taipeh, under the directorship of Y. Fujine. In connection with the latter institution two-year practical courses in agriculture are now given for the benefit of the Chinese population of the island. About 60 boys are now enrolled in these courses. Mr. Yokoyama has been making a careful study of the agricultural extension work in the United States with a view of introducing such features of the work as can be adapted to the conditions in Formosa.

The Experiment Station for Indigo, at Klaten, Java, was discontinued with the close of the past year. The former director of the station, J. J. Hazewinkel, has become assistant director of the West Java Sugar Cane Experiment Station, "Kagok," Pekalongan, Java.

The *Mark Lane Express* notes the opening of a new school of forestry by the commissioner of woods in the Forest of Dean and the High Meadows Woods adjoining. The course will last two years, and will include practical work in the woods, as well as lectures on forestry.

A scheme is on foot for reorganizing the department of agriculture of the Cape of Good Hope, with a view to the creation of a department of agriculture, colonial industries and technical instruction. This would greatly enlarge the present department and its functions, extending its work for agriculture as well as including colonial industries and technical instruction. A commission has been appointed to inquire into and report upon the advisability of such reorganization.

Dr. Burton E. Livingston, of the department of botany, University of Chicago, who has been for some months connected with the work of the Bureau of Soils, has been appointed an expert on the staff of the Bureau, and will enter upon the work in Washington early in April.

T. S. Dymond, of the Essex County Technical Laboratories, Chelmsford, has been appointed to an inspectorship under the board of education, and to act as special advisor in matters relating to rural education, nature study in public schools, agricultural instruction in evening schools, and the advancement of various forms of technical education in rural districts.

R. I. Smith has been appointed State entomologist of Georgia, to succeed Wilmon Newell, who has gone to Louisiana.

The death is announced of Mr. Edmond Philippar, director of the National School of Agriculture at Grignon from 1883 until 1901, when he retired.

EXPERIMENT STATION RECORD.

VOL. XVI. APRIL, 1905. No. 8.

This year may be taken as marking the semicentennial of agricultural education in this country. Fifty years ago the State of Michigan took steps to establish an agricultural college, which was the first institution of the kind in the United States. Two years from now it is planned to celebrate in a fitting way the anniversary of the opening of the college to students, and the occasion will be one of national interest.

The beginning of interest in agricultural instruction in this country dates back to the forties. At that time and in the early fifties the establishment of an agricultural college was quite actively canvassed in New York and Massachusetts, and one or two abortive attempts were made to provide such an institution. Professor Brewer tells of the passage of an act in New York in 1853, mainly on the initiative of Mr. John Dalafield, providing for a State agricultural college to be located on his farm near Geneva. No appropriation was made for buildings or maintenance, and as Mr. Dalafield died the following fall nothing further came of the movement. The State agricultural society was also interested in the subject, and expected much from the People's College.

Agricultural schools were established in various parts of New York by private enterprise between 1845 and 1850, and an agricultural school in Connecticut was opened in 1845 by Dr. S. W. Gold and his son, T. S. Gold, which continued in successful operation until 1869. In 1845 Oliver Smith, of Massachusetts, died, leaving a fund of $30,000 for a farm school and experimental farm, where worthy young men could make a study of agriculture in all its branches. His bequest was to be allowed to accumulate for sixty years, and therefore becomes available the present year.

The interest in agricultural instruction at that early date is the more remarkable considering the educational conditions of the times. The teaching of natural science in the higher institutions was very restricted, and opposition to its introduction had hardly begun to be overcome. Technical schools for other branches were almost unheard of, and manual training as a branch of the educational system did not

receive consideration until many years later. The public school system was still very crude, and high schools were rare outside the large cities. But there was a prevalent idea that science was to be of great value and wide application to the fundamental industry, and the plan to provide special schools for teaching the sciences in these applications met with considerable approval.

Accordingly, when the constitution of the State of Michigan was adopted in 1850, a clause was inserted requiring that "the legislature shall provide for the establishment of an agricultural school for agriculture and the natural sciences connected therewith." In obedience to this provision an act for the establishment of a State agricultural college was adopted by the legislature in 1855 and approved February 12 of that year. A farm of nearly 700 acres, then in the woods and lying 3½ miles east of Lansing, was purchased and buildings erected, and on May 13, 1857, the college was formally opened for the reception of students.

The year following the action of the Michigan legislature, the legislature of Maryland incorporated the Maryland Agricultural College, the corporation comprising about five hundred philanthropic persons who subscribed stock and purchased a farm for the college near Washington; and the same year Hon. Marshall P. Wilder succeeded in obtaining from the legislature of Massachusetts a charter of the trustees of the Massachusetts School of Agriculture.

Near the close of the following year (1857) Justin S. Morrill began his efforts to secure from Congress a land grant for the endowment of colleges of agriculture and mechanic arts, which resulted in 1862 in a gift of over ten million acres of land to the several States for that purpose. Thus the cause of agricultural education was launched.

How slow the progress was from these early beginnings is well known to all students of agricultural education. Without method or precedent to guide them, with little idea of the classification of the subject for pedagogic purposes, with little or no equipment for the agricultural department except a farm, which was expected to be a model and at the same time to demonstrate the practical ability of the professor in charge to make a farm pay, and, above all, in advance of the educational progress of the times, is it surprising that agricultural instruction was not an entire success from the outset?

The agricultural schools of Europe were not patterned after because the conditions and needs in this country were so dissimilar. One man's theory of what should be taught and how it should be imparted was as good as another's, apparently, and there was no end of experimenting in these matters. There was found to be comparatively little of agricultural science to teach at that time—much less in fact than the founders had supposed; and so much stress was laid upon the practical aspects of farming that the instructors were not always men

of the highest scientific attainments. Hence the branches of learning supposed to be related to agriculture and also to promote a *liberal* education were often pressed forward, and by reason of their more advanced position pedagogically came to occupy a prominent place in the curriculum of these colleges.

As time went on the expectations of the early advocates of agricultural instruction were not being realized. The farmers as a rule took little active interest in the college and were often out of sympathy with it. There was no considerable demand for agricultural instruction, and many of those who went to the college were attracted by the opportunity to secure an education cheaply. Other circumstances, such as the civil war and the great movement of people to the new lands across the Alleghanies, combined to delay its progress. Where the colleges were connected with large universities the case seemed especially hopeless. There the sentiment against the agricultural department on the part of other departments of instruction was often in evidence; and because of its weakness and its failure to attract large numbers of students that department was usually given but little either in the way of facilities or financial support.

The experience gained in several decades of experimenting in agricultural instruction, discouraging as it was, was not without result. More was being accomplished than appeared on the surface. Gradually the old theories of teaching agriculture were disproved, and better methods took their place. Some impression was made upon public opinion, and greater respect won for the subject as a department of instruction.

To the men who in the face of these obstacle had been working out the basis for teaching agriculture and building up for it a more intelligent support, much credit and honor are due. They helped to show the value of technical instruction, sentiment for which was now growing, and by the investigations which they made and collated they attracted attention to the increasing basis for a science of agriculture, which broadened the possibilities of teaching the underlying principles of the industry.

Then came the experiment stations, first a few State institutions, which were largely an outgrowth of the influence of the agricultural colleges and were fostered by them. These in time created a demand for national aid, resulting in the establishment of stations throughout the country; and two years later came the Morrill fund, which supplemented the land grant of 1862 with a direct annual appropriation for instruction. For a time it did not appear that the latter was to benefit directly the essentially agricultural features of the colleges, which rarely received any considerable allotment of the fund, the claim still being made that there was small demand for agricultural instruction.

At length a few ambitious leaders set to work to see how the farmers' boys could be gathered into the college for a short period, in order to get an entering wedge and to demonstrate more widely the value of technical training in agriculture. Grades and entrance requirements were swept aside and new facilities were provided. Laboratories were opened for dairying and farm physics and live stock, in addition to those which had previously existed for the sciences, because the inadequate preparation of the boys and the short time they were to spend at the college required that they be taught quite largely through their eyes and their hands.

The experiment was an ultimate success. The press praised the work and helped to advertise it, and the farmers began to talk about it. A new era had begun. There was an awakening not only of interest and of confidence in agricultural education, but also to the requirements for properly teaching the subject. Agriculture must be differentiated; instead of one man being looked to as the personification of all the agricultural information which the institution had to offer, there should be an agricultural faculty. To provide such a faculty and adequate laboratories and equipment required money, much more than the agricultural department had ever been given before. This aroused opposition again, and was looked upon as extravagant and ill advised. It was pointed out how much more it cost to educate a student in agriculture than in literature or the classics or general science.

But the influence of the experiment station in differentiating agriculture was now working, and the necessities of its work soon called for men in different subdivisions of the subject. Gradually the money was secured in a few of the States, thanks to the energy and perseverance and enthusiasm of a few of the leaders, who gathered around them strong and intelligent men to aid in their campaign with State legislatures and public sentiment.

The success of the few stimulated other States to action, and inspired confidence and courage in demanding creditable buildings and support, and in putting the course on a new basis. Men came to the front now who had caught the idea of the new education and who were not afraid, until the movement became widespread and its influence national.

There can be no doubt that the agricultural experiment station and the short courses were very potent factors in bringing about this new era and in making the higher development possible. They served to arouse interest in the subject and to assert its needs, they confirmed the value of agricultural education, showed the relations of science to practice, and enlarged the fund of information upon which the agricultural course rested. They made instruction in agriculture seem not only reasonable but essential to a clear understanding of the progress which was making in applied agricultural science. And they demonstrated the need of specialization in the instruction force;

brought out new methods, and modernized the system of instruction. We now recognize as one of the most important services of the experiment station the furnishing of the materials for an organized science of agriculture which could be reduced to pedagogical form.

A dozen years ago special buildings for agricultural instruction were so rare and novel a feature as to excite much comment. This year the Territory of Oklahoma appropriated $75,000 for an agricultural and horticultural building, following the action of the leading agricultural States. The agricultural colleges in many States are now on an equal basis with other departments of instruction, as far as buildings and facilities are concerned; and it is interesting to note that in this respect the colleges connected with universities have not been behind those existing as independent institutions. For much of of this development we are indebted to the example of the States of the Middle West, which are not bound down by tradition and where there is greater freedom of progress.

Along with these developments in the colleges have come the nature-study crusade and the endeavor to improve the country schools and to teach in them something pertaining to the daily life of the children. Out of this grew the agricultural high schools, and more recently the attempt to modify the course of instruction in the rural schools, so that they will lead up to the agricultural college as they now lead to the general science courses and professional colleges. In some States a point has been reached where instead of bringing the college grade down within the reach of pupils from the poorer rural schools, a high college grade is being established and an attempt made to articulate the common and high schools with it. This is a great step, one which would have seemed very bold ten years ago.

If a half century seems a long time for the working out of these things which now seem so plain and practicable and of unquestionable utility, it should be remembered that agricultural education could not progress faster than the times, although it was conceived in advance of them. Its experience is paralleled by that of science teaching and technical education and manual training and every other radical departure in education.

During the past fifty years the public funds given to education have been mainly used to establish and maintain a system of free elementary education for all the people. The same period has witnessed the development of the public high schools and incorporated technical schools in urban communities, and an efficient system of science teaching in schools and colleges. Agriculture is now beginning to reap the advantages accruing from the settlement of the more fundamental problems of public education. The public mind has not only become thoroughly convinced that the education of all the people

is the duty of the State, but also that this education should be vitally related to the occupations of the masses. The wisdom of agricultural instruction and its tangible value to the country at large and to a wide range of industries directly dependent upon agriculture have now become evident to the pedagogue and the farmer alike, and in an encouraging measure to the legislator as well.

Things always move more slowly at the start, but agricultural education is now moving faster and faster every year, so that with the rapid development of efficient courses for it much greater progress may reasonably be expected in the near future, the effects of which will be far-reaching in our national life.

When the Michigan Agricultural College holds its semicentennial jubilee two years from now, there will be very much to report in the progress of agricultural education and the influence of the agricultural college. There will be great cause for congratulation over what has finally been accomplished, and every encouragement in the outlook, for it will be evident that the dark ages of agricultural education in the United States have passed.

The avenues open to graduates in agriculture increase in number and variety with each year. For a time the agricultural colleges and the experiment stations absorbed those who cared to enter the professional lines of agriculture, and the fertilizer trade was the main outlook of the agricultural chemists on the industrial side. In the course of time State boards and departments of agriculture added agricultural graduates to their forces; and the National Department of Agriculture, as it developed and differentiated, recruited its corps of workers quite largely from that source.

Gradually private enterprise began to employ such men, and the creamery industry now claims many operatives trained in the dairy school. Manufacturing establishments which stand in close relationship to agriculture find it advantageous to have men on their force who are experts in agricultural lines, and this advantage is especially noticeable in establishments which include among their products or by-products materials designed for spraying, feeding, fertilizing, and other agricultural uses. Railroads are coming to find use for such men, as are also large development enterprises of various sorts. The landscape gardener is in steady demand for city parks and private grounds, and the farm superintendent or manager of large estates who has had a college training is becoming more common every year and more sought for.

The usefulness of the economic entomologist in the practical walks of life was long ago recognized, not only as an investigator but in the protection of trees and shrubs of parks and cities. Many municipalities now number such an officer, as they do also instructors in the elements of agriculture and in gardening in the public schools.

Already a field appears to be opening for the consulting agricultural expert in well-to-do communities, to furnish expert advice on the laying out and management of estates and similar matters.

The agricultural press has long recognized the advantages of agricultural training, and now that the demand has grown upon it for more advanced and technical information, men who have studied the science as well as the art have become a practical necessity upon the editorial staff. The introduction of such men has raised the grade of the agricultural paper very materially. To better fit graduates for this work one agricultural college has established during the past year a course in agricultural journalism, which appears to be a timely departure.

The widespread development of popular interest in agricultural matters, in nature study, and in the country generally has opened a considerable field to the agricultural writer outside the farm press. This field is being supplied in a way, but it were infinitely better if more of the popular writing on topics relating to agriculture were done by men of some technical training in that subject, who could more clearly see the bearing of things and more logically and truthfully interpret what they saw for the benefit of the trusting reader. This will probably come in time. There is surely an important place for the trained agricultural writer, both in popular and technical lines.

The various branches of agriculture proper, such as general and special farming, stock raising, dairying, fruit growing, market gardening, floriculture, the nursery business, and the like afford all the advantages to the educated man that they ever did, and men are going from the agricultural colleges to these industries in increasing numbers. The fact that their agricultural education makes them more intelligent, resourceful, and better farmers, and more progressive men generally, is no longer a matter of question. Their neighbors will watch for suggestions and come to them for advice when something new turns up.

These are only a few of the lines of industry in which agricultural graduates now find an active demand for their services. Other avenues will open—are opening every year, now that the meaning of an agricultural education is becoming understood. Already it appeals to a large constituency. It touches the life and the industries of the people at so many points that new uses for the men who have elected that course are bound to arise continually. There is always room for those who wish to engage in the business side of agriculture. There has been a restricted field, which is steadily expanding, for specialists who desired to follow it professionally. To a large body of young men who do not care to enter either of these fields the diploma of the agricultural college is now a passport to remunerative employment in a large number of diverse lines.

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RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Determination of sulphates in plants, G. S. FRAPS (*North Carolina Sta. Rpt. 1903, pp. 69–71*).—From a brief review of the literature of this subject it is concluded that "the quantity of sulphates present may vary considerably in the seeds of different plants, in different parts of different plants, in different parts of the same plants, and in the same plant at different stages of growth."

In determinations made by the author no sulphur was found in corn kernels, peas, green millet, timothy hay, corn silage, peanuts, sorghum, and teosinte, but a trace of sulphate was found in oats, 0.003 per cent in crimson-clover straw, 0.001 per cent in cotton-seed meal, and 0.085 per cent in green cowpea vines. The method employed was to treat 5 gms. of substance with 50 cc. of 1 per cent hydrochloric acid, filter after an hour, wash with the dilute acid to 250 cc., and add barium chlorid to the boiling solution. It is considered erroneous to regard the ash of a plant as consisting of only the inorganic portion.

Colorimetric determination of phosphorus, T. E. HEWITT (*Jour. Amer. Chem. Soc., 27 (1905), No. 2, pp. 121–124*).—The method, applicable especially to determination of phosphorus in iron, steel, etc., is based upon the color reactions due to passing hydrogen sulphid through a sodium-hydroxid solution of the phosphomolybdate.

On the determination of carbonates of calcium and magnesium by Frühling's method, C. MONTANARI (*Staz. Sper. Agr. Ital., 37 (1904), No. 9, pp. 810–814*).

A method for the simultaneous detection of nitric and nitrous acids and for their approximate quantitative determination by means of diphenylamin, P. N. RAIKOW (*Oesterr. Chem. Ztg., 7 (1904), No. 24, pp. 557–561*).—The method proposed is based upon difference in sensitiveness (formation of blue colors) of nitrite and nitrate solutions of different strengths toward sulphuric acid and phosphoric acid solutions of diphenylamin (0.2 gm. of diphenylamin in 100 cc. of sulphuric acid, 1.78 sp. gr., or sirupy phosphoric acid, 1.7 sp. gr.). With nitrates the two solutions are about equally sensitive, while with nitrites the relative sensitiveness is much greater.

A color scale for use with Nessler's reagent, H. BÜELER-DE FLORIN (*Chem. Ztg., 28 (1904), No. 104, p. 1264*).

Report of the chemistry division, J. C. BRÜNNICH (*Queensland Dept. Agr. Rpt. 1903–4, pp. 72–79*).—Analyses are reported of a number of samples of maize, seed wheats, Cape gooseberry pulp, strawberries, red currants, red gooseberries, raspberries, pineapple fruits, mangrove and wattle barks for tanning, peanuts, and cotton seed, as well as ash analyses of pineapple plants.

In the case of wheat and maize the amount of aqueous extract and its composition, ash constituents, and lecithin were determined in addition to the more usual constituents. On an average the Queensland-grown maize contained 12 per cent moisture, 13.1 per cent protein, 5.5 per cent fat, 65.8 per cent carbohydrates, and 1.6 per cent ash. According to the author, the maize has in general a somewhat higher protein content than samples grown elsewhere. "Our maizes containing about 13 per cent of proteids, which nearly approaches the average amount found in wheats,

are thus a much less fattening and a more muscle-forming food than maize containing only 10 per cent of proteids, and may therefore, for instance, be safely used as a substitute for wheat for poultry feed."

According to average figures reported, the wheat contained 11.09 per cent moisture, 14.79 per cent protein, 2.18 per cent fat, 62.4 per cent carbohydrates, and 1.31 per cent ash. Considerable variation in protein content was noticed with the different samples, but on an average the proportion of this constituent was greater, according to the author, than in Continental or American wheats. The average amount of fat was somewhat higher than in Continental, but a little lower than in American wheats. The fact is recognized that the analytical data reported do not determine milling qualities. The lecithin varied from 0.271 to 1.012 per cent of the dry substance in the case of wheat and from 0.174 to 0.482 per cent in the case of maize.

Judged by the chemical composition, flavor, and the favor with which they are regarded where known, the author believes that Cape gooseberries are highly satisfactory for the manufacture of pulp for use in jam and preserve making. The pineapple studies reported have to do with pineapple disease, though definite conclusions are not drawn.

A special study is reported of Soudanese millet and sorghum, made to secure data regarding the poisonous properties sometimes exhibited by such plants. Unmanured Soudanese millet (green material) contained no hydrocyanic acid when 6 weeks old, 0.0053 per cent at 8 weeks, and 0.0011 per cent at 10 weeks. Similar values for specimens grown on land manured with 6 cwt. of nitrate of soda per acre were 0.0102, 0.0090, and 0.0066 per cent. "The result of this work was very instructive, and shows that the higher cultivated fodder plants of the sorghum family are not so dangerous in their earlier stages as the common variety usually grown by our Queensland farmers. It was also again borne out that vigorous growth, particularly on land manured with nitrogenous manure, produces the hydrocyanic or prussic acid yielding glucoside in larger proportion."

The amount of hydrocyanic acid found in sorghum varied with different varieties, the greatest amount reported being 0.81 grains per pound of green material. Generally speaking, the older plants contained less than the younger plants. "The highest amount previously found was 2.4 grains per pound of the green material, or 13.4 grains per pound of the dry material in 5-weeks-old Planter's Friend. The use of such green fodder would be highly dangerous, but as soon as the amount has fallen under 0.5 grain per pound in the green material the fodder may safely be used."

Cucurbits as oil plants, M. EGOROV (*Izv. Moskov. Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *10* (*1904*), *No. 1*, *pp. 348–357*).—The oil was obtained from the ground seeds of squashes and pumpkins by extraction with ether. A physical and chemical examination of the oil gave the following data: Specific gravity at 0° C., 0.9558; specific gravity at 16.5° C., 0.9519; coefficient of viscosity at 16.5° C., 13.5; Reichert number, 1.36; acid number, 0.6173; Köttstorfer number, 195.68; ether number, 194.96, and iodin number, 115.52. The glycerin content was 15.9 per cent.

A study of the composition of the glycerids of the oil showed that volatile acids were present only in traces, the largest part of the nonvolatile acids were liquids, the solid acids consisted of palmitic and stearic acids, while the liquid acids included oleic and linoleic acids. The probable presence of butyric acid was indicated by the odor.—P. FIREMAN.

The occurrence of phloroglucin in plants, C. HARTWICH and M. WINCKEL (*Arch. Pharm.*, *242* (*1904*), *No. 6*, *pp. 462–475*).—Studies are reported which have to do with the presence of phloroglucin or bodies yielding phloroglucin in a number of vegetable products.

The nature of raw starch grains, L. MAQUENNE (*Compt. Rend. Acad. Sci.* [*Paris*], *138* (*1904*), *No. 6*, *pp. 375–377*).—The author regards starch grains as a reversion product, i. e., a formation of insoluble amylocellulose from soluble starch.

Malt analysis, H. A. Hunicke (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1211–1220*).—Comparative tests were made of the effects of different amounts of moisture and different degrees of fineness of grinding upon malt analysis, and possible sources of error in manipulation and analytical processes are spoken of.

The detection of watered milk, A. E. Leach and H. C. Lythgoe (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1195–1203*).—Determinations were made of the refraction of the milk serum of commercial samples of milk and of milk of known purity from Holstein cows. The Zeiss immersion refractometer was found the most useful for this purpose, and a description of this instrument is given. In no instance was the refractometer reading of the serum of pure milk less than 39 at 20° C., and this is, therefore, considered a reasonable minimum figure, below which adulteration with water would be indicated. Tables are given showing the indices of refraction on the Abbé refractometer and the equivalents in scale readings on the immersion refractometer, and also for reducing scale readings at from 15–25° to 20° C.

Determination of fat in milk, M. Henseval (*Rev. Gén. Lait, 3 (1904), No. 23, pp. 529–535, pls. 2*).—The Gerber, Soxhlet, and Gottlieb methods are briefly described and comparative determinations on whole milk, skim milk, and milk homogenized by the process of Gaulin (E. S. R., 15, p. 714) are reported. In general, higher results were obtained by the Gottlieb method, though, on whole milk, the 3 methods agreed closely. Considerable difficulty was experienced at times in applying the Gerber method to homogenized milk, heating and centrifuging two or three times being necessary. A period of 18 to 20 hours was required for extracting the fat from such milk with ether, and then the results were generally lower than by the Gottlieb method. Six samples of homogenized milk showed on an average 3.36 per cent of fat by the Gerber method, 3.51 by the Soxhlet method, and 3.65 by the Gottlieb method.

The results of an examination of an emulsion of cotton-seed oil in skim milk are reported, and attention is called to the possibility of adulterating milk with oils or fats emulsified by the Gaulin process.

Determination of fat in homogenized milk, A. Burr (*Milchw. Zentbl., 1 (1905), No. 1, pp. 6–9*).—Comparative determinations of fat in homogenized milk were made by the Gottlieb-Röse, Adams, and Gerber methods, from the results of which it is concluded that the Gottlieb-Röse method is the most accurate for this purpose.

Investigations with sin-acid butyrometry, Hoffmeister (*Milchw. Zentbl., 1 (1905), No. 1, pp. 20–24*).—Comparative determinations of the fat in milk, skim milk, and buttermilk, with and without the addition of preservatives, were made by the Gerber, Gottlieb-Röse, and the Sichler sin-acid-butyrometric (E. S. R., 16, p. 506) methods. From the results the author concludes that the last method, while not so suitable for numerous determinations as the acido-butyrometric method, may be perfected to compare favorably with other methods.

The relation of cows' milk to Schiff's reagent, and a test for formalin in milk, E. Seligmann (*Ztschr. Hyg. u. Infectionskrank., 49 (1905), No. 2, pp. 325–328*).—Formaldehyde in milk may be detected by distilling and adding to the distillate a solution of fuchsin bleached by sodium sulphite, when a violet-red color appears. The same reaction is given by raw milk which the author finds can be prevented by the addition of an acid to the milk, from which it is concluded that the reaction depends upon some properties of the casein.

To determine the presence of formaldehyde in milk without the necessity of distillation the author therefore adds 2 or 3 drops of sulphuric acid to 5 cc. of the sample, and tests with Schiff's reagent. In dilutions of 1:40,000 the coloration is most distinct at the end of about an hour. Control tests are recommended in all cases.

The preservation of urine samples for analysis, M. S. McDowell (*Pennsylvania Sta. Rpt. 1903, pp. 38–41*).—As formaldehyde did not prove entirely satisfactory for preserving urine, the value of chloroform for this purpose was studied. Three

cc. was added to 175 cc. of fresh urine at first, and as the excess of chloroform, which settled to the bottom of the flask, gradually diminished more was added from time to time to insure an excess of the preservative. This sample and one of equal size to which preservative had not been added were stored in a cool place, the temperature averaging 40 to 50°, and the total and ammoniacal nitrogen were determined at intervals of 1, 2, and 10 days, 1 month, and approximately 2 months.

In the case of both samples, there was no appreciable loss of nitrogen until the end of the first month. In the case of the preserved urine, during the last month there was a loss amounting to 1.77 per cent of the nitrogen originally present as compared with 7.7 per cent in the sample without preservative. The formation of ammonia was checked by the preservative, the increase being only 0.029 per cent in 2 months, whereas in the case of the unpreserved sample it was 0.679 per cent, values which indicate, in the author's opinion, that although chloroform checks a loss of nitrogen it does not entirely prevent it.

The possibility of measuring the loss of nitrogen in the preserved urine by adding daily aliquot samples of normal acid or by drawing air from the flask containing the urine through standard acid is spoken of.

The determination of carbon and hydrogen in urine, F. Thompson (*Pennsylvania Sta. Rpt. 1903, pp. 42–44*).—In connection with respiration calorimeter experiments with a steer (E. S. R., 15, p. 799), the changes which urine undergoes on drying were studied.

In the 4 experimental periods composite samples of 10 days' urine were collected and preserved with a small amount of chloroform. Analyses were made of each composite as soon as possible after it was collected, and again at an interval of 24 hours, or in one case 48 hours. Samples of the urine mixed with finely pulverized and recently ignited copper oxid were placed in a platinum boat and dried in a combustion tube, which passed through an ordinary water-jacketed air bath, the temperature inside the tube being approximately 90° C. A quantity of dry air was drawn slowly through the tube. Assuming that carbon dioxid and ammonia were the end products of any decomposition which might take place, provision was made for collecting the ammonia in standard acid and the carbon dioxid in soda lime. Under these conditions the sample was found to be completely dried after about 15 hours. When constant weight was reached it was transferred to a combustion furnace and the ordinary carbon and hydrogen determinations made.

In every case the sample which was kept longer contained less total solids than the other, and in every case except one the total solids of the older sample contained a higher percentage of carbon and hydrogen. "These results would indicate that there is considerable decomposition upon evaporation to dryness but that it varies in amount, consequently yielding a residue of variable composition." It was also noted that on drying, the older sample gave off more ammonia than the other in every case, but that there was no such regular variation with the carbon dioxid produced. "This would indicate that some decomposition was in progress in the urine at the ordinary temperature, but since the presence of chloroform should prevent any bacterial action any such decomposition would arise from the action of enzyms. The data presented are, however, not sufficient to completely establish this.

"If the ammonia given off is taken as a measure of the urea decomposed it is plainly evident that there is a decomposition of the non-nitrogenous matters present, since from 50 to 80 per cent of the carbon dioxid found is in excess of that necessary to combine with the ammonia to form urea."

The results "would seem to fairly well establish the fact that there is a decomposition of the nitrogenous as well as the non-nitrogenous bodies present."

The estimation of sulphuric acid in urine by means of alcoholic strontium-chlorid solution, R. von Lengyel (*Arch. Physiol.* [*Pflüger*], *104* (*1904*), *No. 9–12, pp. 514–518*).—The author recommends the use of alcoholic strontium-chlorid solution for estimating sulphuric acid in urine, since the method is accurate and rapid.

Experiments on the presence of arsenic in normal tissues as shown by a biological method, M. SEGALE (*Ztschr. Physiol. Chem., 42 (1904), No. 3, pp. 175-180*).—In a large majority of cases the author was able to demonstrate the presence of arsenic by means of *Penicillium brevicaule* in substances of animal origin, but regards it as essential that the material should first undergo autolysis. The method followed is discussed at some length.

The Haldane apparatus; a new method of estimating the carbon-dioxid content of air, B. SWAAB (*Chem. Weekbl., 1, pp. 177-182, 189-192; Chem. Centbl., 1904, I, pp. 745, 746; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, pp. 524, 525, fig. 1*).—A form of apparatus for measuring small amounts of carbon dioxid in air is described.

The determination of carbon monoxid in room air, ALBERT-LÉVY and A. PÉCOUL (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 2, pp. 98, 99*).—Using a modification of Gautier's iodometric method, in which the iodin was determined colorimetrically after absorption in chloroform, as proposed by Rabourdin and Nicloux, the author found it possible to determine accurately as little as one part of carbon monoxid in 200,000 of air.

Invertin in honey and in the intestine of insects, AXENFELD (*Zentbl. Physiol., 17 (1903), pp. 268, 269; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, p. 518*).—The author studied a ferment from the intestinal tract of the bees which is found in natural honey. Artificial honey is, of course, free from this body.

New views on the indirect estimation of extract bodies, K. FARNSTEINER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 10, pp. 593-603*).—The data reported have to do with the analysis of orange, lemon, and raspberry juice and the detection of adulterants.

Chemical department, F. W. TRAPHAGEN (*Montana Sta. Rpt. 1903, pp. 28-37*).—A brief account is given of the work of the chemist during the year, including analyses of Montana coal, clays, apple twigs, wheat grown under irrigation, and miscellaneous samples of barley, flour, alsike and red clover, alfalfa, and Canada field peas.

Miscellaneous analyses, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 46-50*).—In addition to analyses of feeding stuffs noted elsewhere, analyses of 4 insecticides, 6 salt deposits, 11 soils, 6 clays, and 8 fertilizing materials are reported.

Miscellaneous analyses, B. L. HARTWELL and J. W. KELLOGG (*Rhode Island Sta. Rpt. 1904, pp. 261-263*).—Analyses are reported of one sample each of sulphate of ammonia, nitrate of soda, dried blood, hen manure, guano, tankage, fine ground bone, acid phosphate, basic slag meal, air-slaked lime, sulphate of potash, muriate of potash, distiller's grains, and wheat bran, 5 samples of corn kernels, and 2 samples of corn leaves. In connection with the analysis of basic slag meal it is noted that "this material has proved, after a ten-years' test at this station, to be highly efficient immediately, and to possess lasting qualities which make it rank among the best phosphatic manures."

Miscellaneous chemical work, F. W. WOLL, G. A. OLSON, and J. C. BROWN (*Wisconsin Sta. Rpt. 1904, pp. 342-349*).—The solutions and tables used at the station in the determination of nitrogen by the Kjeldahl method are given, and analyses of marsh hay, corn silage, sorghum silage, pea-vine silage, liquid brewery refuse, sugar beets, limestone, shale, fertilizing materials, desiccated milk, and dairy salt are reported. The addition of a so-called blue-pill tablet, weighing, on an average, 0.695 gm. and composed of chrome alum, to 275 cc. of milk changed the specific gravity of the sample to the extent of 0.0019 as determined by the Soxhlet lactometer at 15.5° C., and 0.0018 as determined by the Westphal balance.

Cellulose, cellulose products, and artificial rubber, J. BERSCH, trans. by W. T. BRANNT (*Philadelphia: Henry Carey Baird & Co.; London: Kegan Paul, Trench, Trübner & Co., Ltd., 1904, pp. XXII+345, figs. 41*).—In this valuable summary the author has collected information regarding the distribution and nature of cellulose, its

chemical properties, and related questions; the manufacture of wood stuff or mechanical wood pulp; preparation of cellulose from wood, i. e., wood cellulose or chemical wood pulp; vegetable parchment; the production of sugar, alcohol, and oxalic acid from wood cellulose; viscose and viscoid and their uses; nitro-cellulose, artificial silk, cellulose threads, including cellulose artificial silk and lustra-cellulose, viscose for making textile threads, artificial leather, celluloid, rubber compounds, and rubber substitutes. In every case the processes of manufacture and technical uses of the products are spoken of and the various topics are critically discussed. The volume constitutes a useful handbook for those who are interested in some of the recent developments of applied chemistry, either from a scientific or a technical standpoint.

Laboratories of the chemical department, F. W. WOLL (*Wisconsin Sta. Rpt. 1904, pp. 350–367, figs. 11*).—A detailed illustrated description.

International catalogue of scientific literature. D—Chemistry (*Internat. Cat. Sci. Lit., 2 (1904), pp. VIII+1002*).—This is the second annual issue of this catalogue, and is in continuation of the parts already noted (E. S. R., 14, p. 632, and 15, p. 338).

BOTANY.

Species and varieties: Their origin by mutation, H. DE VRIES, edited by D. T. MACDOUGAL (*Chicago: The Open Court Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., Ltd., 1905, pp. XVIII+847*).—This is a series of 28 lectures delivered by the author before the University of California during the summer of 1904, in which an attempt is made to point out the means and methods by which the origin of species and varieties may become an object of experimental inquiry. The mutation theory with which the author's name is associated is presented in a somewhat condensed form, and original observations which have been noted within the last few years are added. While the present course of lectures is not designed to take the place of the previous publication, it is believed that it will prove a useful substitute for the general reader interested in the subject of plant breeding.

The author claims that his theory is in full accord with the principles laid down by Darwin, and that his work gives a thorough and sharp analysis of some of the ideas of variability, inheritance, selection, and mutation which were necessarily vague at the time of Darwin's investigations. He reviews and criticizes much of the literature relating to plant breeding, and offers many suggestions of lines for future study. The book will be found to be a valuable addition to the rapidly increasing literature relating to the breeding of plants and animals.

Two types of intramolecular respiration of higher plants, A. I. NABOKIKH (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 3, pp. 305–315*).—The author conducted investigations on the anaerobic metabolism of the seeds of peas, castor beans, sunflowers, rape, squash, and lupines, as well as cultures of *Penicillium glaucum*. The plants enumerated were grown in large sealed vacuum flasks, supplied with milk, orange juice, succinic acid, and various nutritive substances, such as glucose, peptone, mannite, and asparagin. Only sterile cultures were analyzed, and the carbon dioxid, alcohol, loss of dry substance, and the acid contents were determined

The anaerobic decomposition of glucose takes place in the majority of seeds independently of the nature of their reserve substances. The alcoholic fermentation was observed in seed of peas, sunflower, rape, and squash, the artificial nutrition of the seeds with glucose increasing the intensity of the alcoholic and carbon-dioxid formation 25 to 100 per cent. The ratio of carbon dioxid to alcohol formed by the peas was found under favorable conditions to correspond exactly to the equation for alcoholic fermentation. The author is convinced that in all plants investigated by him, along with the alcoholic fermentation other processes take place which yield

free carbon dioxid. In support of this claim the results of experiments with the different seeds in glucose and other media are cited.—P. FIREMAN.

Transformation of nitrogenous substances in the ripening of seeds of leguminous plants, N. I. VASILYEV (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 1, pp. 19–54*).—By the investigations of Emmerling, Hornberger, and Nyedokoochayev the fact was established that in immature seeds there are present considerable quantities of nonproteid nitrogen and that the amount of this nitrogen decreases as the seeds ripen, while the proteid nitrogen, on the contrary, correspondingly increases. Moreover, Emmerling and Nyedokoochayev ascertained the decrease, in the process of ripening, of the nitrogen of certain groups of nitrogenous crystalline substances, such as the amido acids, asparagin, and the nitrogenous substances of a basic character. The author has made a study to determine which nitrogenous substances are found in the unripe seeds, and the present article is a contribution to the solution of this problem.

In 1900 and 1901 experiments were made with the seeds of *Lupinus angustifolius* and *Robinia pseudacacia*. From the unripe seeds of these plants were isolated various amido acids, asparagin, and the hexose bases, histidin and arginin. In 1902 the author made more detailed experiments with the seeds of *Lupinus albus* and *L. luteus*, operating with considerably larger quantities. In the unripe seeds of these plants the absence of tyrosin was demonstrated, as was also the case with the other plants named. Phenylalanin was isolated and identified with certainty. This amido acid appears to be accompanied by amidovaleric acid. The bases histidin and arginin were separated in crystalline form. In the process of ripening, the accumulation of proteid bodies takes place at the expense of amido acids, asparagin, and the hexose bases.

The author concludes that the process of ripening is essentially the inverse of germination. While in the process of the germination of the seeds the stored-up proteid substances are transformed into nitrogenous crystalline compounds, such as amido acids, amids, and organic bases, which then appear in the germ, in the process of ripening of seeds the crystalline nitrogenous compounds (amido acids, asparagin, and the hexose bases) pass from the plant into the seeds, where they are converted into stored-up proteid substances. It may perhaps be assumed that the transportation of the albumen produced in the leaves proceeds in the form of those crystalline compounds which in the leguminous plants arrive first at the husks and then at the seeds, where they are again transformed into albumen.—P. FIREMAN.

Study of the variation in seeds during ripening, G. ANDRÉ (*Compt. Rend. Acad. Sci.* [*Paris*], *138* (*1904*), *Nos. 24, pp. 1510–1512; 26, pp. 1712–1714*).—For a considerable time the author has been studying the changes which take place in the seed of lupines, beans, and maize, from the time of their earliest formation until after maturity. Among the changes he found a progressive transformation of soluble carbohydrates into insoluble ones, a process which is the inverse of that taking place during germination. The total amount of nitrogen in proportion to the dry weight of the seed increases with the age of the seed, but the relative percentage is greatest when the seeds are quite young, and also as they approach maturity. The water content of the seeds and pods, or cob in the case of maize, was determined, and its relative amount and fluctuation at different stages of growth are shown.

In the second paper the author notes the changes which take place in the mineral matter of the seeds in a similar way. Tables are given showing that the total ash increases with the advance in maturity up to a certain point, after which there is a steady diminution. This applies strictly in the case of the ash of the pods of lupine and bean and also the ash of the lupine seed, but not for the beans, in which the ash content continued to increase up to the last observation. With the maize there was a progressive increase, but the cob was not fully mature at the last observation.

The relative proportion of mineral matter in the pods increased to the end. The variation in the lime, magnesia, potash, and phosphoric acid content was noted. The relative quantity of lime and magnesia increased progressively in the lupines and beans until approaching maturity, when there was a falling off of about one-fourth in the lime content and a less amount in the magnesia content. In the maize cobs these elements continued to increase until maturity. The potash content continually increased in the pods, cobs, and seed of each species. The amount of phosphoric acid in the dry matter increased in the pods for a while, after which it diminished. The phosphoric acid content in the seed increased continuously, there seeming to be a transfer of this compound from pod to seed, like that from leaves as they approach maturity. Similar results are noted for the grain and cob of maize.

The author proposes to continue these investigations, taking up the changes of organic compounds during the process of ripening.

Golden seal, Alice Henkel and G. F. Klugh (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 6, pp. 16, pls. 2, figs. 4*).—Notes are given on the identification, geographical distribution, and conditions under which the golden seal (*Hydrastis canadensis*) is grown, and the methods of collecting and preparing the rhizomes for market are described. The increased use of this plant in medicine has resulted in a wide demand for information concerning it and the possibilities of its cultivation. The principal supply at present is from wild plants, but it is shown that under artificial shade the golden seal can be cultivated without much difficulty. It is said that the limited demand for the plant will prevent its extensive cultivation, as the price would soon fall to an unremunerative figure.

Barley grass, J. H. Maiden (*Agr. Gaz. New South Wales, 15 (1904), No. 10, pp. 922–924, pl. 1, fig. 1*).—A description is given of barley grass (*Hordeum murinum*), also called squirrel grass, foxtail, etc. This grass is rather widely distributed, not only in New South Wales, Europe, etc., but an allied species occurs in this country, and the effect of the awns on sheep and other animals is shown. Quotations are given from Wyoming Station Bulletin 19 (E. S. R., 6, p. 640) relating to the allied species, in which suggestions are made for the eradication of this pest.

Phosphorescent plants, H. Molisch (*Leuchtende Pflanzen. Jena: Gustav Fischer, 1904, pp. IX+168, pls. 2, figs. 14*).—A physiological study is given of various self-luminous plants. After discussing the rather doubtful possession of luminosity by algæ and related organisms, many of which were found to give negative results, the author takes up the study of self-luminous fungi and bacteria, as well as the causes of phosphorescence in meats, vegetables, insects, etc.

A review is given of the species of fungi and bacteria found to be self-luminous, and 20 species of higher fungi and 26 species of bacteria are listed. About half of the publication is taken up in describing the author's experiments with luminous bacteria, the effect of various substances added to the media in which they were grown, the effect of temperature, growth, etc., being studied. Various theories as to phosphorescence are discussed, and experiments with the bacterial light on other plants are described.

The spectrum of the light was studied, photographs made by the light emitted from cultures, and numerous experiments made which showed positive heliotropism toward the light on the part of numerous seedlings and fungi. The bacterial light was found to be without effect on chlorophyll production, doubtless due to its lack of intensity. In conclusion, the phenomenon of luminosity in higher plants is discussed at some length.

Drift sand reclamation in Australia (*Agr. Jour. Cape Good Hope, 25 (1904), No. 6, pp. 679–685*).—The successful use of marram grass (*Ammophila arundinacea*) on coast sand ridges near Goolwa, South Australia, is described.

The biology of Sterigmatocystis versicolor, H. Coupin and J. Friedel (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 18, pp. 1118–1120*).—This polymorphous

fungus is known under many forms and produces quite a variety of pigments. A biological study was made of it in order to test the effect of culture media on the form, growth, and pigment production. The mold was grown in Raulin solution lacking in various chemical agents, and it was found to be directly influenced by the presence or absence of a large number of compounds.

Some spontaneous variations of Sterigmatocystis versicolor, P. VUILLEMIN (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 22, pp. 1350, 1351*).—The author gives a brief account of some experiments with this interesting mold, the experiments being the result of statements of Coupin and Friedel (see above) in which they showed that the culture medium exercised a definite influence on the growth of the fungus, and the investigations of Mirsky, which seemed to indicate that the rose-colored and green-colored forms of the mold, when cultivated under identical conditions, did not change their color.

The color of this mold is secreted by the conidia, which are sometimes green and sometimes rose colored, and this color being soluble, stains the mycelium and substratum on which the fungus is growing. The investigations of the author show that the fungus has not definitely fixed varieties, but that through frequent replantings normal green forms appear among the rose-colored cultures, and vice versa.

FERMENTATION—BACTERIOLOGY.

Soil bacteria and nitrogen assimilation, F. D. CHESTER (*Delaware Sta. Bul. 66, pp. 24, dgm. 1*).—The author reviews some of the literature relating to soil bacteria and nitrogen assimilation, showing the important rôle played by symbiosis in nitrogen assimilation by soil organisms. A discussion is given of the occurrence in the soil of bacteria which are capable of fixing nitrogen, and the author claims that nitrogen-fixing bacteria are present in all soils and frequently in predominating numbers.

A discussion is given of the identity of the bacteria which are contained in the substance Alinit. The principal organism (*Bacillus ellenbachensis*) in this substance the author claims is identical with others which are commonly distributed throughout the soil and which are usually the predominating organisms of every sample of soil examined. On this account the addition of Alinit to the soil would be superfluous.

A brief discussion is given of the nitrogen-fixing bacteria in the root tubercles of legumes, followed by an account of studies on nitrogen-fixing bacteria which have been carried on by the author during the past year. Cultures of a number of organisms were carried through various media, and the results are shown, from which it appears that all the organisms under observation possessed the power of assimilating free atmospheric nitrogen, although some of them to a very slight extent. The nitrogen-fixing organisms which grow in symbiosis show increased power of assimilation, but the amount is less than the sum of their individual capacities.

The author discusses some of the practical aspects of nitrogen fixation, showing that the organisms are usually present in all cultivated soils and are favored by alkaline conditions. Consequently he recommends deep plowing and thorough tilling as means for stimulating bacterial activity, and the application of humus and lime to soils where they are needed.

The bulletin concludes with an appendix giving technical descriptions of the different species of organisms referred to. A brief bibliography is appended.

The assimilation of free nitrogen by bacteria, G. S. FRAPS (*North Carolina Sta. Rpt. 1903, pp. 64–68*).—This article describes briefly the various means of fixing free nitrogen of the air and reports experiments on the influence of the character of the medium upon the assimilation of nitrogen by bacteria. The method used was as follows:

"Two hundred cubic centimeters of the culture liquid was placed in a 500 cc.

Erlenmeyer flask, with 1 gm. of soil or calcium carbonate if either were required, the flask was plugged with cotton wool, and the liquid sterilized by heating to boiling for a few minutes. For the inoculation of the culture liquid 5 gm. of soil, in the moist condition, were shaken with 100 cc. water, the soil allowed to settle, and 2 to 5 cc. of the infusion were added to the liquid, the same quantity being used for each flask in a set.

"The determinations were made in duplicate, and correction made for nitrogen in the soil infusion and reagents, by means of a blank test. The blank was made up in exactly the same way as the other, but was sterilized after the soil infusion had been added.

"The flasks were placed in a water bath and kept at 33° for 2 weeks at first, and afterwards for 1 week, as there was a little gain of nitrogen during the second week. The contents of the flasks were then transferred to Kjeldahl flasks, evaporated to a paste with the addition of a small amount of sulphuric acid, and nitrogen determined by the Kjeldahl method."

The following is a summary of the more important results obtained:

"(1) The nitrogen-assimilating bacteria were most active in an alkaline medium containing glucose, potassium phosphate, sodium chlorid, calcium carbonate, magnesium sulphate, and ferric chlorid in the proportions given, less active when the magnesium sulphate was omitted, and very much less active in neutral liquid containing mannite, potassium sulphate, ferric chlorid, and soil.

"(2) It is possible that in some soils there are nitrogen-assimilating bacteria which are more active in an alkaline medium, and in other soils those which are more active in a neutral medium.

"(3) Addition of magnesium chlorid or the substitution of glucose by starch did not increase the assimilation of nitrogen.

"(4) Slightly more free nitrogen was assimilated in two weeks than in one week.

"(5) The nature of the soil used for inoculating the medium is probably of some effect."

Bacteria and yeasts in their domestic and agricultural relations, F. KIENITZ-GERLOFF (*Bakterien und Hefen insbesondere in ihren Beziehungen zur Haus- und Landwirtschaft zu den Gewerben, sowie zur Gesundheitspflege. Berlin: Otto Salle, 1904, pp. 100, figs. 65*).—After discussing the distribution, historical investigations, and methods of studying organisms of fermentation and infection, the author gives briefly an account of the methods recommended for the preservation of foods, and describes the life history of numerous bacteria, yeasts, molds, etc. A chapter is devoted to the general subject of alcoholic fermentation and the methods now in use, after which acetic, lactic, and butyric acid fermentations are described. The function of bacteria in cellulose fermentation, in retting flax, etc., is pointed out, and a general discussion is given of the rôle of bacteria in nitrogen assimilation.

The work concludes with an account of bacteria as causing certain diseases, such as anthrax, tuberculosis, influenza, diphtheria, etc., and the more recent ideas regarding the treatment of these diseases are given.

The action of metallic alkaline earths on yeasts, N. C. PAULESCO (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 2, pp. 158–160*).—A study has been made of the possible relationship between the minimum quantity of the salts of calcium, strontium, barium, and magnesium required to check the elimination of carbon dioxid by yeasts, and the molecular weight of those salts. Cultures of yeasts were prepared and varying quantities of different salts of the above metallic alkaline earths were added to the solutions. The limit was found to be approximately represented by the molecular weight of the compound divided by 1.1, showing that the inhibiting power varied with the molecular weight.

Laboratories in agricultural bacteriology, H. L. RUSSELL (*Wisconsin Sta. Rpt. 1904, pp. 368–373, figs. 3*).—A detailed account is given of the bacteriological laboratories in the new building of the Wisconsin Station (E. S. R., 15, p. 6).

METEOROLOGY—CLIMATOLOGY.

Meteorological observations at the Michigan Agricultural College for 1903 (*Michigan Sta. Rpt. 1904, pp. 132–155*).—Tabulated daily and monthly summaries of observations during 1903 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc.

Meteorology, C. W. NORRIS and T. M. CARPENTER (*Pennsylvania Sta. Rpt. 1903, pp. 45–59, 221–245*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 15, p. 124). Monthly summaries of observations are given in the body of the report and the detailed record in an appendix. The summary for 1902 is as follows:

Summary of meteorological observations, 1902.

	1902.	Growing season (Apr.-Sept.).
Barometer (inches):		
Mean	29.982	
Highest	30.822 (Jan. 28)	
Lowest	29.245 (Feb. 28)	
Temperature (°F.):		
Mean	48.3	61.3.
Highest	89 (July 17)	89 (July 17).
Lowest	—1	26 (Apr. 4).
Mean daily range	16.6	18.7.
Greatest daily range	34 Jan. 2–Dec. 2	
Least daily range	2 (Nov. 18)	
Mean daily relative humidity (per cent)	79	76.3.
Rainfall (inches):		
Total	41.83	20.48.
Greatest monthly	6.71 (June)	
Greatest daily	1.97 (June 29)	1.97 (June 29).
Number of days on which 0.01 in. or more of rain fell.	138	65.
Mean percentage of cloudiness	48.6	42.3.
Number of days on which cloudiness averaged 80 per cent or more	103	34.
Average hours of sunshine per day		7 h. 19 m.
Last frost in spring		May 29.
First frost in fall		Sept. 14.

Report of the meteorologist, N. HELME (*Rhode Island Sta. Rpt. 1904, pp. 265–281*).—This includes general notes on the weather during the year ended June 30, 1904, and a tabulated record of observations at Kingston on temperature, precipitation, cloudiness, and prevailing winds during each month from July, 1903, to June, 1904, inclusive, with a summary for the year ended June 30, 1904. The latter summary is as follows:

Temperature (degrees F.).—Maximum, 93, July 10, 1903; minimum, —16, January 5, 1904; mean, 45.7; highest monthly mean, 69.2, July, 1903; lowest monthly mean, 20.6, January, 1904; highest daily mean, 81.5, July 10, 1903; lowest daily mean, —4, January 4, 1904. *Precipitation* (inches).—Total (rain and melted snow), 50.06; greatest monthly, 9.70, April, 1904; least monthly, 0.75, September, 1903; greatest in 24 consecutive hours, 2.68, August 5, 1903; snowfall, total 53. *Weather*.—Number of clear days, 156; number of fair days, 107; number of cloudy days, 103; number of days on which there was precipitation of 0.01 in. or more, 118. *Prevailing wind*, west.

Meteorology (*Rpt. Agr. Work, Expt. Fields and Govt. Lab. [British Guiana], 1903–4, pp. 3–5*).—A summary is given of observations during the 6 months ended June 30, 1904, on sunshine and on amount and composition of the rainfall. It is estimated that during the year ended June 30, 1904, the rainfall carried down to the soil "0.6 lb. of combined nitrogen equal to, in round figures, 3 lbs. of sulphate of ammonia and chlorin equivalent in round figures to 217 lbs. of common salt per acre."

Rainfall, H. S. LAWRENCE (*Dept. Land Records and Agr., Bombay Pres., Season and Crop Rpt. 1903–4, pp. 1–3, II–XIII*).—Summaries are given of rainfall during 1902 and 1903 in different parts of the Bombay Presidency.

Sun spots and rainfall, R. DEC. WARD (*Science, n. ser., 21 (1905), No. 528, pp. 231, 232*).—Notes are given on a discussion by H. I. Jensen in the *Proceedings of the Royal Society of New South Wales*, vol. 38, of the relations between solar and terrestrial phenomena, in which the author agrees with the conclusions reached by the Lockyers regarding the connection between solar and meteorological variations, but inclines to the opinion that the epochs of sun-spot maxima are generally periods of excessive rainfall. The author also insists that more emphasis should be laid upon geographical position in considering the meteorological conditions of any place.

A discussion of the relation between sun spots and thunderstorm frequency at Vienna by G. Walter, in *Das Wetter* for December, 1904, is also referred to in which the conclusion is reached that a year with few thunderstorms almost always precedes a year of sun-spot maxima.

Influence of the forests of the Landes on the rainfall régime of the neighboring regions, particularly on the north side of the Pyrenees, E. MARCHAND (*Compt. Rend. 2. Cong. Sud-Ouest Nav., Toulouse, 1903*).

The influence of cannonading on snow storms (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 26, p. 1680*).—The dissipation of a snow storm in Hyères on April 2, 1904, by cannonading is reported.

The moon and the barometer, A. B. MACDOWALL (*Nature [London], 71 (1905), No. 1840, p. 320, fig. 1*).—The relation of barometric variations to phases of the moon are compared for the summer half of the year on the basis of observations at Ben Nevis from 1884 to 1892 and at Greenwich from 1889 to 1904. The curves plotted for each place show "few days of low barometer about (just after) full and new moon, many such days about (just after) the quarters." The results, therefore, for the summer half of the year seem to confirm the popular belief that the weather tends to be more settled about full moon. The régime for the winter half of the year (October to March) appears to be somewhat different, but has not yet been definitely worked out.

Summer night frosts in Sweden, 1871–1900, H. E. HAMBERG (*K. Svenska Vetensk. Akad. Handl., 38 (1904), No. 1, pp. 94, pls. 4*).—A study of the frost phenomenon, the occurrence of night frosts and their intensity in different seasons and sections of Sweden during the period from 1871 to 1900. The statistical data referring to the questions studied are presented in detail in the report, and such discussions and deductions given as seemed warranted by the data.—F. W. WOLL.

The importance of the nitrogen of the air and of the soil in plant production, LÖHNIS (*Deut. Landw. Presse, 31 (1904), No. 98, pp. 817, 818*).—The influence of fallow on soil nitrogen and on the activity of soil organisms is briefly discussed.

WATER—SOILS.

A microscopic examination of the State College water supply (not including bacteria), W. A. BUCKHOUT (*Pennsylvania Sta. Rpt. 1903, pp. 179–182*).—The character of this water supply is described, and a brief account is given of results of microscopic examinations of the water at intervals of 2 to 4 weeks throughout the year.

Soil water (*Rpt. Agr. Work, Expt. Fields and Govt. Lab. [British Guiana], 1903–4, p. 5*).—Examinations with reference to chlorin and nitrogen as ammonia and as nitrates during July, 1903, and June, 1904, of "soil waters collected from a depth of 4 ft. 6 in. from the surface soil and which percolated through the bottom of a shallow well with concreted sides in the gas house at the government laboratory," are reported.

Summer fallow and the conservation of moisture in the soil, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 39, 40*).—This work is in progress in a section of the State where the rainfall is about 10 in. A table is given showing the percentage of soil moisture on different dates from May 1 to July 24 on 2 plats of alfalfa, one sown broadcast and the other drilled; a plat of bare summer fallow, and a plat of wheat. The percentage of moisture was in nearly all cases highest on the bare summer fallow.

Contributions to our knowledge of the aeration of soils, E. BUCKINGHAM (*U. S. Dept. Agr., Bureau of Soils Bul. 25, pp. 52*).—"The object of this paper is to add to our information regarding the aeration of soils, primarily the escape of carbonic-acid gas from its seat of formation in the soil, and the entrance of oxygen to take its place. The specific points treated are: (1) The relative importance of diffusion and of changes in barometric pressure; (2) the influence of texture, structure,[a] and compactness; (3) the actual amounts of carbonic acid leaving and of oxygen entering the soil under definite conditions of temperature, porosity, and composition of the soil atmosphere.

"The experimental work deals (1) with the mixing of carbonic acid and air by diffusion through layers of soil of known area, thickness, and porosity when the total pressure is kept the same on both sides of the soil layer, and (2) with the rate of flow of air through the same layer of soil in precisely the same physical state under the influence of a slight excess of pressure on one side of the layer."

The development and operation of the methods used are explained.

"The soils used were of several types, each in various states of compactness, etc., and while the experimental results are few, because of the great time expended in searching for suitable methods of experiment and by the actual measurements even after fairly satisfactory methods had been devised, it is believed that the results are sufficient to warrant some general conclusions," among which are that the rate of diffusion of gas from the soil into the atmosphere, or vice versa, "varies approximately as the square of the porosity of the soil, and that this diffusion follows the laws for the free diffusion of gases. It thus becomes possible to calculate the rate of aeration in any particular soil from results obtained in experiments on free diffusion.

"Tables are given showing the rate of escape (and, consequently, for a condition of equilibrium, the rate of formation as well) of carbon dioxid in the soil when the porosity of the soil and the concentration of the carbon dioxid at any given depth are known."

The results indicate also "that the aeration of soils is almost entirely due to diffusion phenomena, changes in barometric pressure having very little influence in comparison."

Ohio soil studies, I, A. D. SELBY and J. W. AMES (*Ohio Sta. Bul. 150, pp. 81–145, pls. 5, dgms. 10*).—Complete mechanical and chemical analyses of samples of soils (first 6 in.) and subsoils (second 6 in.) from the experimental plats of the station farm at Wooster, from the farm of the State University at Columbus, and from the test farms at Strongsville, Neapolis, Germantown, and Carpenter are reported, and the significance of the results is discussed, the origin, geological relations, and general character of the soils and the methods of analysis used being fully described. The average results of the mechanical analyses are given in the following table:

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[a] The term "structure" is, for brevity, used with the meaning "state of granulation."

Results of mechanical analyses of soils and subsoils.

	Number of analyses.	Very coarse sand (2-1 mm.).	Coarse sand (1-.5 mm.).	Medium sand (.5-.25 mm.).	Fine sand (.25-.1 mm.).	Very fine sand (.1-.05 mm.).	Silt (.05-.01 mm.).	Fine silt (.01-.005 mm.).	Clay (<.005 mm.).	Total mineral matter.	Loss on ignition.	Total.
Wooster, East Farm:		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Soil	18	0.72	1.01	0.83	1.93	20.81	25.15	40.28	4.60	95.32	3.57	99.95
Subsoil	18	1.04	1.13	1.02	1.99	18.89	26.31	28.26	6.57	95.80	3.11	100.01
Wooster, South Farm:												
Soil	4	.52	1.02	.74	1.42	17.07	27.81	41.74	4.26	94.65	4.21	100.05
Subsoil	4	.40	.69	.70	1.34	18.79	29.68	36.53	7.38	95.64	2.88	99.76
Wooster, average:												
Soil	22	.69	1.01	.82	1.75	20.13	25.64	40.57	4.54	95.30	3.64	99.89
Subsoil	22	.93	1.06	.95	1.86	18.82	26.92	37.94	6.71	95.77	3.07	99.97
Strongsville:												
Soil	18	1.74	2.39	2.32	5.14	10.63	27.03	35.21	7.18	91.64	6.51	99.99
Subsoil	18	.99	1.47	1.83	4.42	8.04	28.42	33.45	15.61	94.61	3.91	100.38
Columbus:												
Soil	2	.83	2.10	2.71	7.78	17.77	28.29	28.22	6.12	93.83	4.69	99.68
Subsoil	2	.65	1.99	2.59	8.08	17.66	27.29	28.57	7.42	94.27	4.36	99.84
Neapolis (yellow sand):												
Soil	3	.13	1.03	3.37	37.54	46.29	2.57	3.40	2.46	96.80	2.43	100.20
Subsoil	3	.31	1.33	3.00	32.78	52.11	2.40	2.76	2.39	97.11	1.18	99.32
Neapolis (black sand):												
Soil	2	.02	.81	2.81	31.52	51.59	2.20	2.80	1.22	92.99	5.51	99.72
Subsoil	2	.01	.76	2.54	32.20	51.59	3.45	2.75	2.07	95.42	3.16	99.92
Germantown:												
Soil	1	1.04	1.93	1.96	4.31	9.09	50.21	17.72	8.89	95.18	3.46	99.69
Subsoil	1	1.19	1.79	1.86	4.33	12.94	40.96	18.43	14.58	96.08	3.12	100.38
Carpenter:												
Soil	2	.52	1.80	1.55	2.33	4.75	47.43	26.01	9.71	94.08	4.89	100.08
Subsoil	2	.35	1.27	1.21	1.48	3.52	46.50	24.62	16.01	94.96	3.72	99.89

The average results of the chemical analyses were as follows:

Results of chemical analyses of soils and subsoils.

	Number of analyses.	Insoluble matter and soluble silica.	Potash K_2O.	Soda Na_2O.	Lime CaO.	Magnesia MgO.	Ferric oxid Fe_2O_3.	Alumina Al_2O_3.	Phosphorus pentoxid P_2O_5.	Sulphur trioxid SO_3.	Water and organic matter.	Total nitrogen.
Wooster, East Farm:		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Soil	16	88.73	0.216	0.39	0.28	0.39	2.67	2.79	0.089	0.04	4.41	0.096
Subsoil	16	87.87	.246	.38	.27	.37	3.32	3.41	.098	.04	4.11	.064
Wooster, South Farm:												
Soil	5	87.53	.314	.24	.21	.39	2.70	3.21	.157	.03	4.93	.091
Subsoil	5	87.67	.265	.28	.20	.45	3.26	3.56	.144	.03	4.02	.060
Wooster, average:												
Soil	21	88.44	.239	.26	.26	.39	2.68	2.88	.105	.03	4.52	.093
Subsoil	21	87.85	.250	.34	.25	.39	3.30	3.46	.109	.04	4.09	.061
Strongsville:												
Soil	13	83.58	.205	.29	.22	.46	3.24	3.27	.127	.05	8.31	.187
Subsoil	13	83.80	.215	.29	.18	.45	4.72	4.11	.091	.03	5.92	.074
Columbus:												
Soil	8	83.44	.564	.74	.56	.62	3.41	4.85	.142	.09	5.86	.249
Subsoil	8	83.87	.559	.78	.69	.62	3.63	4.26	.150	.10	5.64	.135
Neapolis (yellow sand):												
Soil	2	93.21	.053	.06	.19	.12	.99	.99	.125	.03	3.95	.091
Subsoil	2	94.31	.065	.07	.14	.13	.82	1.97	.115	.02	2.29	.037
Neapolis (black sand):												
Soil	2	90.37	.050	.09	.30	.13	.67	.80	.135	.03	7.17	.120
Subsoil	2	93.18	.060	.09	.24	.14	1.12	1.34	.110	.01	3.78	.113
Germantown:												
Soil	1	90.55	.142	.21	.11	.31	1.68	3.17	.102	.03	3.70	.090
Subsoil	1	89.20	.210	.23	.13	.37	2.26	3.69	.115	.03	3.86	.090
Carpenter:												
Soil	2	85.73	.187	.11	.18	.30	2.73	3.99	.112	.03	6.89	.138
Subsoil	2	84.75	.255	.12	.15	.37	3.47	4.87	.084	.03	5.58	.070

"It will be observed that the average of 18 plats in the various sections at Wooster, exclusive of the south farm, gives in the mechanical analysis 25.23 per cent total sand for the soil and 24.10 per cent for the subsoil. The total silt in the soil is 65.43 per cent, in the subsoil 64.57 per cent. The clay in the soil is 4.71 per cent, in the subsoil 6.57 per cent. The coarse gravel, which may in fact be added to the sand for a final sand-like total, amounted on the average in these plats to 5.84 per cent for the soil and 4.62 per cent for the subsoil.

"The south farm shows in an average of four plats 20.83 per cent total sand in the soil and 21.94 per cent total sand in the subsoil, while the same shows in total silt 69.55 per cent for the soil and 66.20 per cent for the subsoil. . . .

"The per cent of clay in these is 4.26 for the soil and 7.38 for the subsoil, while the coarse gravel is only 1.94 per cent on the average for the soil and 0.66 per cent for the subsoil. It will be noted that the loss on ignition is relatively higher for the south farm when the soil is considered and less in the subsoil than of the other Wooster soils examined. . . .

"The insoluble matter and soluble silica in the Wooster soils is quite high, and the actual soluble plant food is contained in a very small percentage of the total soil weight. The percentage of potash in the soil is about 0.25 per cent, being almost the same in soil and subsoil. It will be noted, however, that on the average the south farm plats give 0.10 per cent higher content of potash in the soil than does the remainder of the station farm. The percentage of lime in the Wooster soils is quite low, amounting to less than 0.3 per cent. The percentage of magnesia is somewhat higher than that of lime, amounting to about 0.4 per cent. The percentage of phosphoric acid, or phosphorus pentoxid, is a little more than 0.12 per cent, being higher in the south farm than in the remainder. The ratio of lime to magnesia in average of all is about 1:1.5.

"It is proposed to call this soil type of the station farm the Wayne silt loam."

The total sand in the Columbus soil amounts "to 31.2 per cent in the soil and 30.98 in the subsoil, and the total silt 56.51 in the soil and 55.86 in the subsoil, while the percentages of clay are 6.12 per cent in the soil and 7.42 per cent in the subsoil."

There is almost double the soluble soil constituents in the Columbus soil as compared with that found in the Wooster soil. "The percentage of potash is more than double, while the other constituents, such as lime and magnesia, are increased in a slightly smaller proportion. The ratio of lime to magnesia is 1:1.007, showing the close relation of the soil to the limestone in this respect." The phosphoric acid, however, found in the Columbus soils in this series of plats is but little if any greater in quantity than that found in the Wooster soils.

"Olentangy silt loam is suggested as a name for this soil type."

"The Strongsville soil contains 22.23 per cent total sand, while the subsoil contains only 17.25 per cent. These selfsame soils give 62.24 per cent silt, while the subsoil contains practically the same amount, 61.87 per cent. In clay the soil yields 7.2 per cent clay against 15.6 per cent in the subsoil. The coarse gravel amounts to 3.66 per cent in the soil and less, or 2.98 per cent, in the subsoil. The loss on ignition is very high in these soils, amounting to 6.51 per cent, as a result, perhaps, of their having been some years in sod.

"The chemical analyses give 83.58 per cent insoluble matter and soluble silica in the soil and the same amount, approximately, in the subsoil. Here the insoluble matter and soluble silica is quite a little less than at Wooster, while practically the same in amount as that found at Columbus. The potash found is less than at Wooster, 0.205 per cent, and less than half that at Columbus. The lime content is even less than at Wooster, only 0.22 per cent, while that of magnesia amounts to 0.46 per cent, and the ratio of lime to magnesia becomes 1:2.09. . . . Notable percentages of iron oxid and alumina are also found, approximating quite closely to the corre-

sponding percentages at Wooster, while falling below those at Columbus. The phosphorus pentoxid (phosphoric acid) amounts to a little more than at Wooster, 0.13 per cent, almost the same as found at Columbus.

"The water and organic matter give high percentages, as already indicated, probably due to the prolonged sod condition of the soil previous to the beginning of experiments. The total nitrogen in this case amounts to 0.19 per cent and is quite high for the same apparent reason. If we look to the subsoil as compared with the soil, no conspicuous differences in chemical composition are especially noticeable. . . . We propose the name of Cuyahoga silt for this soil type. . . .

"As might be expected in the drift sands of the lake shore [the Neapolis] soils contain of mechanical elements about 88 per cent sand. . . .

"The other mechanical elements are not conspicuous, amounting to but 5.17 per cent total silt, although the clay percentage, 1.92, is rather unexpected. The coarse gravel is nothing. The average loss on ignition is not large, amounting to 3.21 per cent in soil against 1.70 per cent in the subsoil, while this ignition loss is but 0.95 per cent in the soil of the drift sand and 0.36 per cent in the subsoil of the same.

"The chemical analyses show even higher percentages of insoluble matter and soluble silica than found at Wooster, amounting to 91.17 per cent in the soil and 93.75 per cent in the same number of subsoil. The lime is on the average 0.24 per cent and the magnesia 0.13 per cent in the soil, giving the ratio of lime to magnesia, approximately, 2:1. The amount of phosphorus pentoxid (phosphoric acid) is unexpectedly high, being 0.13 per cent in the soil. In respect to phosphoric acid content the soils at Neapolis show as high percentage as any of those of which chemical examinations have been made, and higher than at Wooster. Potash is low, only 0.05 per cent. Here it is the phosphoric acid contained in the soil which stands out conspicuously in a secondary sense; the same may be stated of the lime; it is approximately equal to that found at Wooster and Strongsville. . . .

"The silt character of the Germantown soil is shown in the mechanical analyses of the soil and subsoil in question, which has been included by Dorsey and Coffey in the 'Miami clay loam,' yet which seems to be even more properly called here the Germantown silt, yielding as it does in the soil 18.36 per cent of total sand, 67.93 per cent of total silt and, in our sample, about 9 per cent of clay.

"The chemical analyses bring out the differences between this soil and that of Strongsville, which in our test-farm work may be regarded as somewhat allied in physical behavior. Potash, lime, magnesia, and phosphoric acid are all very low, while the insoluble matter and soluble silica is quite high, 90.5 per cent. Possibly the least expected is the very low lime content, only 0.11 per cent in the soil and 0.13 per cent in the subsoil, with a lime-magnesia ratio of 1:2.8 and of 1:2.9 in soil and subsoil, respectively. The deep-lying limestone strata of this area have apparently given little chemical character to this test-farm soil.

"The soils at Carpenter are upland in character, being derived from certain coal measure shales as before explained. The mechanical analyses show a pronounced 'silt clay' with 10.94 per cent total sand, 73.44 per cent total silt, and 9.71 per cent clay in the soil; the subsoil gives much less sand, slightly less silt, and a high percentage of clay, 16.01 per cent.

"In chemical composition the Carpenter soil is low in potash, 0.19 per cent, and especially low in lime, 0.18 per cent, with a lime-magnesia ratio of 1:1.75; in the subsoil this ratio becomes 1:2.6, having there less lime and more magnesia.

"It is proposed to call this soil type the Meigs silt clay, since it will include quite a range of soils derived like this from the yellow shale immediately overlying the Ames limestone."

Studies of muck and peat soils, A. R. Whitson and C. W. Stoddart (*Wisconsin Sta. Rpt. 1904, pp. 200–219, figs. 8*).—The general character of muck and peat soils

in Wisconsin is described, and the results of several years' experiments at the station on muck soils (E. S. R., 16, p. 29) and of preliminary experiments during one year on peat soils are summarized. The general conclusions drawn are:

"(1) The marsh soils of Wisconsin belong to two distinct types: (1) The black marsh or muck soils usually underlaid by clay and (2) the peat or moor soils usually underlaid by sand.

"(2) The black marsh soils are fertile except in comparatively small areas where they require potash.

"(3) The peat soils, especially where underlaid by sand, will require both potash and phosphoric acid or an application of manure to make them productive.

"(4) The results of the experiments made this summer do not indicate that the use of lime on this soil will be especially beneficial. This is a matter, however, which needs further study.

"(5) These soils are adapted, on account of the large amount of nitrogen they contain, to such crops as corn, rape, and the hay grasses. The danger of injury from frost, however, lessens somewhat their adaptability to corn.

"(6) The injury from frost can be greatly lessened by drainage."

On the structure of cultivated soils, A. DELAGE and H. LAGATU (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 24, pp. 1043, 1044*).—The author advocates microscopic examination, with polarized light, of layers of fine earth of 0.01 mm. in thickness as a valuable means of determining the character and composition of soils. His observations indicate that soil proper is the result of disaggregation rather than decomposition of the mineral constituents of the original rocks; that is, the feldspar, quartz, mica, calcite, apatite, etc., found in the fine soil are identical in character with the same constituents in the original rock. When finely ground a certain amount of these substances is dissolved directly in the soil solution, leaving the remainder unchanged in composition.

The method of examination proposed furnishes a means of rapidly determining the constituent elements of the soil and their form of combination, as well as the minerals from which they have been derived, and is a valuable supplement to chemical analysis.

On the mineral constituents of cultivated soils, A. DELAGE and H. LAGATU (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 26, pp. 1233–1235*).—The results of microscopic examinations of 4 samples of soil taken at random are briefly reported, to show the complexity of the mineral constitution of soils in general and the value of this method of examination in determining the origin of soils.

The constitution of cultivated soils, A. DELAGE and H. LAGATU (*Ann. École Nat. Agr. Montpellier, n. ser., 4 (1905), No. 3, pp. 200–220*).—A detailed account of investigations noted above.

Soil analysis as a guide to the manurial treatment of poor pastures, T. B. WOOD and R. A. BERRY (*Jour. Agr. Sci., 1 (1905), No. 1, pp. 114–121*).—The results of cooperative experiments on different kinds of soils, including analyses of the soils and fertilizers used and a record of yields obtained, are summarized with reference to their bearing on this subject.

The general conclusions reached are "that except in extreme cases the determination of the percentages of 'total' nitrogen, phosphoric acid, potash, and lime in a soil does not give reliable indications as to the possibility of improving the pasture by manuring. Determination of the percentage of phosphoric acid soluble in 1 per cent citric-acid solution does generally give reliable indications as to the probable success of phosphatic manuring, provided that for pasture soils the limit below which 'available' phosphoric acid may be considered as deficient is fixed as high as 0.02 per cent.

"Potash manuring is suggested as likely to give distinct results if the soil contains not more than 0.01 per cent of potash soluble in 1 per cent citric-acid solution. Lim-

ing is not indicated as likely to be profitable unless the soil contains certainly less than 0.25 per cent of chalk. Basic slag is nearly always a better source of phosphoric acid for pastures than superphosphate, unless perhaps when the soil contains an exceptionally high percentage of chalk.

"Pastures are not likely to be improved by manuring unless their soil contains fair proportions of both large and small particles, and the effect of manures is greater the more regularly the various grades of different-sized particles are represented in the constitution of the soil.

"Determinations of citric acid, soluble phosphoric acid, and potash, and of calcium carbonate, and mechanical analysis of the soil, together with careful observations of the herbage which the land in its unmanured condition is producing, may be expected to indicate clearly those soils which are likely to be improved for pasturage by manuring with phosphates and potash."

Relation of yield to the amount of water-soluble plant food materials in soils, F. H. King (*Wallace's Farmer, 30 (1905), No. 4, pp. 112, 113*).—The results of experiments on this subject are briefly summarized.

Contributions to the chemical study of soils, waters, and mineral products of the region of Chari and Lake Tchad, A. Hebert (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 3, pp. 163–165*).—A recent mission sent into these regions under the leadership of A. Chevalier collected numerous samples of geological, agricultural, and industrial interest, including type soils under cultivation or which bore special useful plants—coffee, cotton, *Gossypium anomalum*, etc., minerals and mineral products, mineral efflorescence (alkali), and waters.

All the soils were very sandy and generally rich in nitrogen. There was, however, a considerable proportion of clay and sodium salts, but an almost entire absence of lime, magnesia, potash, and phosphoric acid. The salts resulting from the evaporation of the lake water in shallow estuaries were alkaline, emitting an odor of ammonium or methylamin, and were composed largely of sodium sulphate, with some potassium salts. Sulphids and considerable amounts of nitrogenous organic matter were also present.

Preventing soil washing, A. M. Soule (*South. Agr., 34 (1904), No. 23, p. 1*).—Deep plowing and green manuring are the remedies proposed.

Utilization of salt land, W. L. Summers (*Jour. Agr. and Ind. South Australia, 8 (1904), No. 4, pp. 217–219*).—A series of experiments with different crops on alkali lands in Southern Yorke Peninsula of South Australia is reported. These experiments show that with proper methods of culture good yields of such crops as rape, kale, mangels, and saltbush can be produced on these lands.

Culture of the Landes, E. Leroux (*Jour. Agr. Prat., n. ser., 8 (1904), No. 46, pp. 632–634*).—A brief general discussion is given of the best methods of bringing these lands under cultivation.

Studies in nitrification, G. S. Fraps (*North Carolina Sta. Rpt. 1903, pp. 33–54, figs. 2*).—A detailed account of investigations briefly reported elsewhere (E. S. R., 14, p. 850).

Nitrifying power of typical North Carolina soils, W. A. Withers and G. S. Fraps (*North Carolina Sta. Rpt. 1903, pp. 57–63*).—In this study it was found that "(1) the nitrifying power of 15 North Carolina soils varied from 11 to 106, thus showing a great difference in the capacity of different soils to serve as media for the growth of nitrifying organisms; (2) the soils with the lowest nitrifying power are sands with low water capacity, low humus, low absorptive power for ammonia, low acidity, and a moderate amount of humus; (3) acidity of the soil did not prevent the growth of the nitrifying organisms; (4) a soil with a low water capacity, low absorptive power, or low humus does not necessarily have a low nitrifying power."

Nitrification of different fertilizers, W. A. Withers and G. S. Fraps (*North Carolina Sta. Rpt. 1903, pp. 27–32*).—In continuation of investigations reported in a

previous bulletin (E. S. R., 14, p. 1056) a study was made of the rate of nitrification of barnyard manure, dried blood, cotton-seed meal, fish, ammonium sulphate, and bone in rich and poor sandy soil and in rich and poor clay soil from the college farm.

"In soils taken from the field in the natural state, the rank of the fertilizers after 4 or 5 weeks varied somewhat from soil to soil. The amount of nitrogen nitrified in the form of cotton-seed meal being placed at 100, the variations were as follows: Ammonium sulphate, 13 to 127; dried blood, 70 to 120; fish, 85 to 190; bone, 22 to 43. Some of this variation may be due to variation in the activity of the organisms. With 16.1 gm. dried barnyard manure to 500 gm. soil, less nitrification took place in 4 or 5 weeks in 3 of the soils than when nothing was added. In the fourth soil, 0.5 per cent of the nitrogen was oxidized. With smaller amounts of barnyard manure, different results might be obtained."

Nitrification of ammonia fixed by chabazite, W. A. WITHERS and G. S. FRAPS (*North Carolina Sta. Rpt. 1903, pp. 55, 56*).—In a study of the rate of nitrification of ammonia fixed by chabazite representing zeolitic silicates of the soil it was found that the ammonia so fixed was nitrified more rapidly than ammonium sulphate or cotton-seed meal, indicating that zeolitic silicates in soils may possibly aid in the nitrification of ammonium sulphate by fixing a portion of the salt.

The nitrification of the ammonia of the soil, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 8 (1904), No. 52, pp. 824, 825*).—Experiments by Wagner and others are cited to show that nitrification of ammonium salts is more rapid the smaller the amount of the salts and the more thorough their diffusion in the soil.

Experiments on the nitrification of various nitrogenous fertilizers, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 9 (1905), No. 3, pp. 78, 79*).—A brief popular discussion of this subject based upon the experiments of P. Wagner on the relative fertilizing value of different nitrogenous materials, and of J. Stoklasa on the relative nitrifying power of different soil organisms.

FERTILIZERS.

Town stable manure: Its chemical composition and the changes it undergoes on keeping, B. DYER (*Jour. Agr. Sci., 1 (1905), No. 1, pp. 108-113*).—Analyses of 7 samples of London stable manure prepared with peat moss and straw or mixtures of the two as litter are reported, both in the fresh state and after storage in large heaps in an open field from summer to the following spring. The variable character of such manure and the changes which it undergoes in storage are briefly discussed.

Rendsburg fecal fertilizer, H. WEHNERT (*Mitt. Deut. Landw. Gesell., 19 (1905), No. 53, pp. 327-329*).—This fertilizer is a mixture of fecal matter, street sweepings, and garbage. It is of variable composition, containing on the average about 1 per cent of nitrogen and phosphoric acid and 0.5 per cent of potash.

The Wonderfontein caves, H. INGLE (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 217-221, pls. 3*).—A brief report on the bat guano deposits of these caves.

Two years' comparative tests of Peruvian guano and ammoniated superphosphate, A. ARNSTADT (*Deut. Landw. Presse, 32 (1905), No. 3, pp. 17, 18*).—The experiments were made with barley and potatoes. The fertilizers used were crude Peruvian guano containing 7 per cent of nitrogen, 18 per cent of phosphoric acid, and 2 to 3 per cent of potash; a modified Peruvian guano containing 7 per cent of nitrogen, 9.5 per cent of phosphoric acid, and 1 to 2 per cent of potash; and ammoniated superphosphate containing 9 per cent each of nitrogen and phosphoric acid. In both years and with each crop the Peruvian guano proved superior to the ammoniated superphosphate.

Calcium cyanamid, A. D. HALL (*Jour. Agr. Sci., 1 (1905), No. 1, pp. 146-148*).—The preparation and character of this material are briefly described, and experiments

with it in comparison with sulphate of ammonia on mangels, swedes, and mustard at Rothamsted are reported. While the results are somewhat conflicting on account of unfavorable season, the conclusion is drawn "that calcium cyanamid is an effective nitrogenous manure, though more extended experiments are necessary to decide whether the unit of nitrogen is worth more or less in its case than in sulphate of ammonia."

On lime nitrogen, Franck (*Deut. Landw. Presse, 32 (1905), No. 5, pp. 34–36*).—The investigations with reference to this material are briefly reviewed, and the rules to be followed in its use as a fertilizer are given. It is stated that it should not be used in larger amounts than 150 to 300 kg. per hectare (133½ to 267 lbs. per acre), corresponding to 30 to 60 kg. of nitrogen (26.7 to 53.4 lbs.). To secure more satisfactory distribution, it is better to mix the material with about twice its weight of dry earth. It should be applied from 8 to 14 days before seeding and thoroughly incorporated with the soil to a depth of 3 to 5 in.

It is claimed that the experiments with lime nitrogen show in general that this substance is about equal in fertilizing value to sulphate of ammonia and nitrate of soda pound for pound of nitrogen.

A commercial nitrogenous fertilizer (*Ztschr. Angew. Chem., 18 (1905), No. 2, p. 72*).—A note on a German patent taken out by the Cyanid Company of Berlin, on a process for preparing cyanamid (H_2CN_2) and related products from cyanamids of the metals for use as fertilizers.

Fertilizer experiments with lime nitrogen for fodder beets (*Deut. Landw. Presse, 32 (1905), No. 1, p. 5*).—Field experiments in which nitrate of soda (15 per cent nitrogen) was used at the rate of 250 kg. per hectare (222.67 lbs. per acre) and lime nitrogen (19 per cent nitrogen) at the rate of 200 kg. per hectare (178.14 lbs. per acre). The season was very dry and the nitrate of soda was of no benefit, although the lime nitrogen increased the yield to a decided extent. When applied 14 days before planting no injurious effects were noticed.

Nitrogen in agriculture, W. Somerville (*Bul. Dept. Agr. [Jamaica], 3 (1905), No. 1, pp. 7–10*).—An abstract of a paper before the British Association, discussing briefly the chemical fixation of atmospheric nitrogen, the preparation and use of Nitragin of Nobbe and Hiltner, and the inoculating material prepared by this Department.

Progress in the manufacture of nitrates, J. Pellissier (*Jour. Agr. Prat., n. ser., 8 (1904), No. 52, pp. 830, 831*).—A brief review of progress made in electrical methods of preparing nitrates.

The use of nitrate of soda and of chemical fertilizers in agriculture and viticulture, Dusserre et al. (*Ann. Sci. Agron., 2. ser., 9 (1904), II, Nos. 2, pp. 210–320; 3, pp. 321–449*).—This is a detailed summary of observations and results of experiments during 1903 in France, Switzerland, Algeria, and Tunis.

In general the season of 1903 was not favorable to such experiments as are here recorded. There was in general an excess of humidity, resulting in diseases of various kinds and interfering with the proper harvesting of the crops. In spite of these unfavorable conditions the use of chemical fertilizers was as a rule profitable. Especially was this true with nitrate of soda, which proved highly beneficial on all crops and soils. The conclusion is reached that nitrate of soda judiciously used insures a profitable increase in the yield of crops.

Nitrate of soda and sulphate of ammonia, L. Grandeau (*Jour. Agr. Prat., n. ser., 9 (1905), No. 4, pp. 109, 110*).—A brief discussion of the relative fertilizing value of these materials based mainly on the investigations of Lawes and Gilbert, and Wagner. It is stated in conclusion that while the results in general show a superiority of the nitrate over the sulphate, the character of the soil and meteorological conditions may modify the relation of the two materials as regards fertilizing value.

British ammonium sulphate trade (*Engin. and Min. Jour., 79 (1905), No. 6,*

p. 273).—The amount of ammonium sulphate produced in the United Kingdom during 1904 is stated as 244,500 long tons.

On the method of formation of fossiliferous phosphate of lime of the Province of Oran, DION (*Sur un mode de formation des phosphates de chaux fossiles de la Province d'Oran. Bordeaux: Société de Pharmacie de Bordeaux, 1904; rev. in Rev. Sci.* [*Paris*], *5. ser., 3* (*1905*), *No. 6, p. 184*).—After discussing various theories of formation, the author concludes that these deposits are formed by the infiltration of phosphatic solutions derived from bones of animals.

Note on potash fertilizers, E. LEROUX (*Jour. Agr. Prat., n. ser., 9* (*1905*), *No. 4, pp. 116, 117*).—Experiments made during 1904 in the Department of Puy-de-Dôme on soils rich in potash are briefly reviewed. In all cases the use of potash fertilizers resulted in largely increased yield.

The action of crude and pure potash salts in the presence of various forms of lime, W. SCHNEIDEWIND and O. RINGLEBEN (*Landw. Jahrb., 33* (*1904*), *pp. 353–371; abs. in Chem. Centbl., 1904, II, No. 10, p. 789*).—With an insufficiency of lime in the soil, kainit was less effective than chlorid or sulphate; otherwise the kainit was more effective than the higher percentage salts.

Gypsum was injurious to grass mixtures when used with kainit. Oats were not so sensitive, and the yield and starch content of potatoes were increased by applications of gypsum. In a sand mixture poor in potash and of limited volume kainit was as effective as other potash salts. With larger pots and soil somewhat richer in potash the results were more in agreement with those observed in practice.

The associated salts in kainit were beneficial to cereals and beets. The beneficial effect of sodium salts is not due entirely to their taking the place of potash, since they often increase the yield in cases where there is an excess of potash. It is suggested that this may be due to the solvent and diffusing action of sodium salts on other plant-food constituents. Almost identical amounts of potash were taken up by plants from the different forms used (chlorid, sulphate, kainit). The chlorin of the salts used accumulated in the straw of the cereals and in the leaves and vines of the root crops.

Magnesium as a manure, H. J. WHEELER and B. L. HARTWELL (*Rhode Island Sta. Rpt. 1904, pp. 221–260*).—This article reviews the literature of this subject and summarizes the results of pot and field experiments at the Rhode Island Station, which have been in progress since 1896. From the results obtained it appears that "of two lots of soil from the college and station farm one appeared to be benefited by magnesium salts in the presence of liberal amounts of the three essential elements of plant food and in the presence of sufficient calcium carbonate to preclude probable injury from acidity. Any probable deficiency of magnesia would be covered for many years by a single application of magnesian lime. Occasional applications of wood ashes or double sulphate of potash and magnesia would accomplish the same result.

"Indications are afforded that certain writers in attempting to explain injury from manures containing magnesia and from magnesium salts, according to Loew's theory of magnesium poisoning, have caused undue alarm as to danger in that specific way in actual farm practice, and, furthermore, many of the observations which have been cited in support of the theory admit of more ready explanation along other lines. It appears to be altogether too early to attempt to state what is the best relation of lime and magnesia for plants, for the reason that plants may, and doubtless do, differ tremendously in this particular, and certain important factors have been frequently ignored which should have been given consideration before attempting to draw definite conclusions in this line, even for small groups of plants."

Investigations on the action of different forms of lime and magnesia, D. MEYER (*Landw. Jahrb., 33* (*1904*), *pp. 371–404; abs. in Chem. Centbl., 1904, II, No. 10, pp. 789, 790*).—In the pot experiments reported magnesium carbonate and burnt

magnesia were nearly as effective as calcium carbonate on all plants, except lupines, which were experimented with, the experimental plants including horse beans, vetches, peas, red clover, mustard, and carrots.

Magnesia was more injurious to lupines than lime. Pure carbonates of lime and magnesia were more effective than powdered marble and magnesite. When burnt, however, the latter were more effective than the former. With applications of magnesia the lime content of the plant was in general lowered and the magnesia content increased. The lime content of the horse bean seeds was somewhat increased with moderate applications of lime. The magnesia content was influenced to a decided extent by applications of both lime and magnesia.

No very close relation between maximum yield and the ratio between lime and magnesia in the soil was observed. With an insufficient amount of lime in the soil the yield was increased both by applications of lime and of magnesia. On the other hand, if the soil contained a sufficient amount of lime, but varying amounts of magnesia, the yield was reduced by applications of both lime and magnesia. The lime requirement of a soil appears, therefore, to be determined only by the lime content, except in case of soils which are especially rich in magnesium carbonate.

A 10 per cent solution of ammonium chlorid was found to be a much more satisfactory solvent for determining the easily available lime and magnesia in soils than 10 per cent hydrochloric acid. The different plants experimented with varied widely in their behavior toward large applications of magnesia.

Fertilizers and the drought of 1904, E. Leroux (*Jour. Agr. Prat., n. ser., 8 (1904), No. 52, pp. 825–827*).—The results of field experiments in different parts of France during the dry season of 1904 are briefly summarized, showing that in all cases the chemical fertilizers produced a beneficial effect.

Demonstration fertilizer experiments in Carinthia in 1903, H. Svoboda (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 12, pp. 833–857*).—The results of cooperative experiments on 137 different farms are reported, with analyses of the soils experimented with. An attempt is made to trace the relation, if any exists, between the productiveness of the soil and the amount of fertilizing constituents shown by ordinary chemical analysis, and the conclusion is reached that carefully conducted fertilizer experiments furnish the only reliable means of determining the fertilizer requirements of soils.

The development of the manufacture of chemical fertilizers (*Ztschr. Angew. Chem., 18 (1905), No. 4, pp. 129–132*).—The history of the development of the fertilizer manufacturing industry is briefly reviewed, especially the discovery and exploitation of guano and phosphate deposits and the manufacture of superphosphates.

The judging of the quality of commercial fertilizers, T. Knösel (*Ztschr. Angew. Chem., 17 (1904), pp. 1788–1791; abs. in Chem. Centbl., 1905, I, No. 1, p. 44*).—The author discusses the relative merits of Thomas slag treated with sulphite solution (E. S. R., 15, p. 764) and other fertilizers.

The value of commercial fertilizers, Aumann (*Ztschr. Angew. Chem., 18 (1905), No. 3, pp. 96, 97*).—This is a reply to Knösel (see above) maintaining the correctness of the author's former valuations of two of Knösel's fertilizers.

Analyses and valuations of commercial fertilizers, J. P. Street, W. P. Allen, and V. J. Carberry (*New Jersey Stas. Bul. 177, pp. 42*).—This is the second report on fertilizer inspection during 1904, the first being given in Bulletin 176 of the station (E. S. R., 16, p. 556). It deals with the inspection as a whole, and includes discussions of trade values of fertilizing ingredients for 1904 and the composition of the standard materials supplying them, compares station valuations with actual selling prices, makes suggestions regarding the purchase of fertilizers, and reports results of examinations of 86 samples of standard unmixed materials, 4 home mixtures, 20 special mixtures, and 434 samples of complete fertilizers. The analyses indicate that the fertilizers were as a rule of good quality.

Inspection of commercial fertilizers, 1904, F. W. Woll and G. A. Olson (*Wisconsin Sta. Rpt. 1904, pp. 338–341, 377, 378*).—A brief account is given of the results of inspection during the year with the text of the State fertilizer law.

Mineral resources of the United States, calendar year 1903, D. T. Day (*U. S. Geol. Survey, 1904, pp. 1204*).—This is the twentieth annual report of this series, an advance summary of which has already been noted (E. S. R., 16, p. 557). Among the substances of agricultural interest for which statistics are given are phosphates, marls, gypsum, clay products, cement, and salt.

FIELD CROPS.

The Agricultural Department, F. B. Linfield (*Montana Sta. Rpt. 1903, pp. 19–27*).—The work of the department for the year is briefly noted. Fifty-two varieties of wheat were grown on plats one-sixtieth of an acre in size. The yields ranged from 20 to 72 bu. per acre, with an average of 42.6 bu. The yields of 30 varieties of oats varied from 56 to 145 bu. per acre, and averaged 103 bu., while 33 varieties of barley, ranging in yield from 50 to 97 bu. per acre, gave an average of 64.1 bu.

A series of 1-acre plats used for a 6-course rotation experiment during the past 6 years was this year sown to oats, and the yields of this crop as it followed peas, wheat, clover, barley, sugar beets, and oats were compared. After wheat the yield was 1,590 lbs. and after peas 3,405 lbs. of grain per acre. Where the oats followed clover, 2,760 lbs. of grain per acre was obtained, while after barley the yield was only 1,335 lbs., and after oats 1,952 lbs. The plat which had produced sugar beets the year before yielded 2,620 lbs. of grain per acre.

The results of an experiment with nitrate of soda and Thomas slag as fertilizers for wheat, oats, and barley showed that the use of 200 lbs. of nitrate of soda per acre increased the yield of wheat by 15 bu.; oats, 4.7, and barley 21.5 bu., as compared with the plat receiving no fertilizers. Thomas slag alone increased the yield of wheat and barley, remaining apparently without effect on the yield of oats; while Thomas slag and nitrate of soda applied together gave an increase in yield for all 3 crops. Cooperative tests with varieties of wheat, oats, barley, peas, and potatoes previously tested at the station for 4 years, are described.

Experiments with grain and forage plants, 1904, R. A. Moore and A. L. Stone (*Wisconsin Sta. Rpt. 1904, pp. 289–316, figs. 11*).—Of 18 varieties of oats under test, Swedish Select, also known as Wisconsin No. 4, has given the best general results during several years. The straw of this variety is stiff, and about 60 per cent are twin oats. The station work with oats is discussed and a classification with regard to the development of kernels of grain in the plant is given.

Among the varieties of barley Manshury, Golden Queen, and Silver King, both believed to be from Manshurian stock, and Oderbrucker stand at the head. The 6-rowed varieties have led in yield and in ability to stand up well, while the 2-rowed produced a heavier grain. Oderbrucker and Manshury stand close to each other in yield and weight of grain. The albumen content of Oderbrucker is about 15 per cent and that of Manshury 13 per cent, and in order to test the value of a barley high in albumen for brewing purposes, arrangements have been made by the station to furnish 100 bu. of Oderbrucker for a malting test. Petkus and Schlanstedt fall rye continued to give good returns.

A yellow variety of peas obtained from the Minnesota Station in 1902 matured in 104 days and again gave good returns, yielding 38.5 bu. per acre. The yields of 10 varieties of soy beans ranged from 10.2 to 24.5 bu. per acre. In 1903, U. S. No. 9407 and Early Brown yielded 50 and 40 bu. of dried beans, respectively, but this season the yields were reduced by unfavorable weather. Analyses made by G. A. Olson, of the station, show that the samples of soy beans contained 10.53 per cent of moisture, 36.25 per cent of protein, 16.90 per cent of fat, 4.15 per cent of crude fiber, 25.97 per

cent of nitrogen-free extract, and 6.20 per cent of ash. Directions for cultivating the crop and inoculating the soil are given. During several years' work with the soy bean the station has observed that on land which has never produced the crop, from 3 to 4 years of continuous growing are required to develop nodules upon the roots of all the plants.

On April 10, 1903, alfalfa was sown at different rates on fall-plowed land with barley and oats as a nurse crop. Three varieties were used, Turkestan, American, and Sand Lucern. After the barley was harvested a cutting of 1.5 tons of hay per acre was secured in the fall, after which the crop made sufficient growth to withstand the winter, but after the harvest of the oat crop no hay was obtained, the entire growth being left for winter protection. The next season, following a severe winter, the plants were practically all alive, and the plats with oats as a nurse crop the year before gave the best growth and were 4 days earlier than the barley plats.

Of the varieties, Turkestan was the least satisfactory. Sowing the seed at the rates of 20 and 35 lbs. per acre showed but little difference, while with from 15 lbs. of seed the stand was a little too thin. A top dressing of finely rotted manure given in the winter showed good effect. Cutting is recommended when about one-fifth of all the plants are in bloom. The crop this season furnished 4 cuttings, as follows: June 6, July 12, August 12, and September 16. The method of haying is briefly described. American gave a total yield of 5.7, Turkestan 5, and Sand Lucern 5.6 tons of hay per acre. Fifteen lbs. of seed per acre gave 5.3 tons of hay; 20 lbs., 5.5 tons; and 35 lbs., 5.6 tons.

The main roots of alfalfa sown in the spring of 1901 had penetrated the soil to a depth of 5 ft., while the rootlets went considerably deeper. The roots of the crop sown the spring of 1903 had reached a depth of 3 ft. From observations made throughout the State alfalfa seems to develop nodules naturally on Wisconsin soils.

The method of breeding grain and forage plants pursued by the station is described, and the results of tests with corn are presented. Minnesota No. 13 corn was tested on a breeding plat, the seed obtained from each selected ear representing a row in the plat. The results are tabulated in detail. This variety was fully ripe September 23, and the total yield of ear corn per row ranged from 63.5 to 129 lbs. Each row also seemed to have characteristics peculiar to itself in leaf as well as in ear development. The best ears were again selected from each row for seed, and the quantity thus secured varied from 8.5 to 50 lbs. per row.

Iowa Silver King was grown in an 18.5-acre field to determine the cost of growing corn and to secure seed. Thirty bu. of choice seed corn were selected, but no ears were taken from stalks which had produced suckers, in order that the tendency to sucker might be eliminated. The percentage of smut developed in the field was only 1.7. A yield of 72.5 bu. per acre was secured, of which 12 bu. were select seed corn, 48.5 bu. marketable feeding corn, and 12 bu. soft corn and nubbins. An itemized statement of the labor and expense involved in producing 2.5 acres of this corn is given, from which it appears that the cost of growing, harvesting, and cribbing 1 acre was $19.78, or approximately 27 cents per bushel.

Forage plants, J. W. Blankinship (*Montana Sta. Rpt. 1903, pp. 66–68*).—Among forage grasses suitable on semiarid ranges several species of blue joint (Agropyron) have been grown successfully at the station for several years, but an attempt to secure a stand of buffalo grass (*Bouteloua oligostachya*) met with failure. The value of one species of blue joint (*Agropyron occidentale*) as a hay grass in different sections of Montana is discussed. Experiments at the station have shown that the grass is readily grown from ordinary planting.

Variety tests, A. K. Risser (*Pennsylvania Sta. Rpt. 1903, pp. 82–94*).—The results of plat tests with wheat, oats, and potatoes are reported. The wheat was drilled at the rate of 8 pk. per acre on September 8. The land had received a top-dressing of 8 tons of barnyard manure per acre, was then plowed on August 20, and at the time

of drilling given an application of 180 lbs. per acre of commercial rock phosphate with 14 per cent of available phosphoric acid.

The average yield of the 13 smooth varieties was 32.09 bu. and of the 7 bearded varieties, 32.33 bu. per acre, the extremes in yield being 26.90 and 35.37 bu. The bearded varieties gave 237 lbs. of straw more per acre than the bald varieties, and also weighed 1.67 lbs. more per bushel. This season Forty Fold or Golden Coin stood first in yield and Fulcaster fourth, while among the varieties now under test for 14 years Fulcaster leads in yield of grain and straw and weight per bushel.

Land was plowed March 21 and given cultivations with a spring-tooth harrow at different times before April 20, when it was rolled and oats were drilled at the rate of 8 pk. per acre. An application of 160 lbs. of South Carolina rock with 14 per cent of available phosphoric acid was made at this time. The 20 varieties under experiment ranged in yield from 47.52 to 64.60 bu. per acre, with an average of 57.58 bu. The weight per bushel varied from 29.71 to 33.41, the leading variety being Long White Tartar. The 3 most productive varieties for the season were Czar of Russia, Japan, and Silver Mine. Japan also produced the heaviest yield of straw, 3,447 lbs. per acre. This variety has been grown for 13 years, with an average yield per acre of 49.66 bu. and an average weight of 32.08 lbs. per bushel.

The land for potatoes was treated with 8 tons of barnyard manure per acre and plowed about 8 in. deep on April 3, and the planting was done on May 5 and 6. Of the 43 varieties tested, Carman No. 3, Early Rose, Eureka, and Thorborn yielded over 200 bu. per acre, the yields being 270.2, 250.2, 227.1, and 202.2 bu. per acre, respectively. The lowest yield, 21.8 bu. per acre, was obtained from White Mountain, which was considerably injured by blight. The average yield of all varieties for the season was 135.7 bu. per acre. Early Rose gave the highest yield of merchantable tubers, while in percentage of marketable potatoes Heath Medium Late Surprise ranked first. Among the varieties grown for 9 years Carman No. 1 and Freeman led in productiveness.

Miscellaneous work, J. WITHYCOMBE (*Oregon Sta. Rpt. 1904, pp. 28, 29*).—The results of silage investigations showed that steamed corn silage contained much less acid than unsteamed, and that the cost of steaming was more than repaid in the improved quality of the silage. Whole clover or vetch silage was more expeditiously handled than cut silage, but it required more space for a given weight. The moisture, dry matter, and protein were determined in 6 varieties of barley, and are given in a table. At the station the common field pea and alfalfa have been successfully grown without irrigation.

Studies of the influence of the soil on the protein composition of crops, A. R. WHITSON and C. W. STODDART (*Wisconsin Sta. Rpt. 1904, pp. 193–199*).—As in similar experiments previously noted (E. S. R., 14, p. 955), the protein content was determined in plants grown in the plant house and in the field. The crops under test were corn, rape, and sorghum.

In the plant house the crops were grown on 3 sand plats and on a clay loam plat extremely rich in nitrates. The first of the 3 sand plats was watered with lake water containing no nitrates, the second with the same water containing a small quantity of sodium nitrate, and the third with water containing double this quantity. Enough fertilizer was used to keep the second plat moderately fertile and the third very fertile with reference to nitrates. On the second and third sand plats and on the clay loam plat the corn plants produced contained 25, 37, and 44 per cent more protein, respectively, than those from the plat receiving no nitrates.

Rape sown April 1 on the 3 sand plats contained 1.41, 1.46, and 1.76 per cent of protein, respectively. The rape from seed sown with corn on July 15 contained approximately 5 and 10 per cent more proteid nitrogen in the plants from the second and third plats, respectively, than those from the first. The sorghum on plat 1 contained 0.778 per cent of proteid nitrogen; on plat 2, 0.822 per cent, and on plat 3, 0.849 per cent.

In the field corn and sorghum were grown on a marshy soil showing considerable inequality. The corn plants which had made a good growth contained about 15 per cent more protein than the same weight of plants having made a poor growth. The better developed plants of sorghum in the outer row had nearly 21 per cent more proteid nitrogen than good plants from the inner rows of the plat, and 51 per cent more than poor plants, while good plants from the inner rows had 25 per cent more than the poor plants.

It is concluded that the relative amount of protein in the plant varies considerably and is dependent upon the conditions of growth, in which the fertility of the soil is an important factor. The results with sorghum in the field also indicated that the distance of planting exerts an influence in this connection.

The pure culture method of soil inoculation, T. R. Robinson (*South. Planter, 66 (1905), No. 1, pp. 8–10*).—This article describes in detail the method of soil inoculation with pure cultures for growing clover and alfalfa and other leguminous crops on uninoculated soil, and compares the same with the practice of using for this purpose soil from old fields which have produced such crops. The commercial production of the cultures is also mentioned.

Unirrigated alfalfa on upland, J. E. Payne (*Colorado Sta. Bul. 90, pp. 31–33*).—Instances of growing alfalfa as a forage crop on unirrigated land in eastern Colorado are mentioned and notes on sowing the seed and on the location of the field are given. Insect enemies and methods of combating them are also discussed.

The influence of cultural methods on the yield of barley, S. Tretyakov (*Khutoryanin, 1903, No. 45; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 4, pp. 540, 541*).—The effects of using barnyard manure in barley culture were observed on the Poltava Experiment Field from 1887 to 1895. Manure applied to winter cereals 2 years before growing barley apparently produced an average increase of 32.3 per cent in the yield of grain and 38.3 per cent in the yield of straw. In the rotation barley after a leguminous crop, such as alfalfa, gave even better yields than after the application of barnyard manure.—P. FIREMAN.

The nitrogen content of barley and malt, Prior (*Mitt. Österr. Vers. Stat. u. Akad. Brauind. Wien, 1904, pp. 1–5; separate from Allg. Ztschr. Bierbrau. u. Malzfabrik., 1904, May*).—A discussion of the value of barley for malting in relation to its nitrogen content.

The distribution of nitrogenous material in barley, E. Jalowetz (*Mitt. Österr. Vers. Stat. u. Akad. Brauind. Wien, 1904, p. 1; separate from Allg. Ztschr. Bierbrau. u. Malzfabrik., 1904, May*).—In the upper or germ end of the barley grain the author found 2.84 per cent nitrogen (water-free material), in the middle portion 1.79 per cent, and in the lower end 2.31 per cent. These observed data are discussed in relation to malting and brewing.

Clover selection, F. W. Card and A. E. Stene (*Rhode Island Sta. Rpt. 1904, pp. 202–205*).—An experiment begun with the view to studying the individuality of clover plants is described, and a report of progress for the season is given. The work thus far calls attention to the great variation in clover plants grown from commercial seed.

Corn culture, R. J. Redding (*Georgia Sta. Bul. 65, pp. 185–198*).—This bulletin presents the usual report on the corn culture experiments of the station, previously noted (E. S. R., 14, p. 855). In addition to experimental results, the meteorological data for this and previous seasons are given and the importance and method of seed corn selection discussed.

Fourteen varieties grown in 1904 gave an average yield of 20.88 bu. per acre. Marlboro and Albemarle headed the list with 26 and 25.25 bu. per acre, respectively. During the years 1895 to 1904, inclusive, the best varieties tested have given an average of 10.87 bu. more per acre than the poorest varieties. The results of two experiments with fertilizers indicated that concentrated fertilizers produced but

little residual effect, and that a crop given commercial fertilizers should be immediately followed by a catch crop in order that any remaining available plant food may be taken up. Heavy applications of commercial fertilizers for corn are not considered expedient. In one of these experiments muriate of potash showed a greater residual effect than acid phosphate or cotton-seed meal.

Corn selection, F. W. CARD and A. E. STENE (*Rhode Island Sta. Rpt. 1904, pp. 206–211, pls. 2*).—Experiments in the selection of sweet corn were begun in 1898 for the purpose of determining the influence of selection in increasing the number of ears per stalk. In one line of the work the seed was always taken from the lower ear from stalks producing the largest number of ears, and in the other from the upper ear of stalks producing the largest number of ears. The object was to test the theory that because the lower ear is less perfectly developed than the upper ear the seed used from this ear will increase lower ear production and consequently the number of ears on the stalk.

The results for the year are given in tables. The average number of ears per stalk where the selection was from the lower ear was 1.38, and where the selection was from the upper ear 2.76. The results are considered as showing "that it is the characteristics of the parent which produced the seed that are likely to be perpetuated, rather than the characteristics indicated by position or type of the individual seed itself. . . . So with corn, the character of the plant from which the seed came is of much more importance than the point on that plant from which it came."

Iowa's campaign for better corn, P. G. HOLDEN (*Amer. Mo. Rev. of Reviews, 30 (1904), No. 178, pp. 563–567, figs. 5*).—An article describing a campaign of instruction, with a view to improving methods of corn culture and increasing the yield within the State. The lecturers and others interested were conveyed in a special train. In 8 days 150 lectures on corn culture and corn improvement were delivered to over 17,000 people. The principal points discussed were the low average yield, a poor stand, unsuitable varieties, corn selection and breeding, and the importance of testing and grading seed. A method of making a germination test of seed corn is described.

Emmer and spelt, C. E. SAUNDERS (*Canada Cent. Expt. Farm Bul. 45, pp. 16, figs. 6*).—This bulletin gives general descriptions of emmer and spelt, compares the two grains, and describes several varieties of each. Directions for the cultivation of common emmer are given, and the yields of this variety compared with the yields of several varieties of wheat as shown by the results obtained at the five experimental farms of the Dominion.

The conclusion drawn from these results is that "common emmer can not generally be depended upon to give as large a crop of grain as the most productive varieties of wheat." A similar comparison of this crop with oats and barley shows that Mensury barley gave larger yields at all the experimental farms and Banner oats at every farm except at Brandon. The composition of the whole grain, kernels, and hulls of red and common emmer and red and white bearded spelt, as determined by A. T. Charron, is given in a table. The data indicate that the kernels of emmer and spelt contain about 3 per cent of albuminoids more than the kernels of Mensury barley.

Hop drying, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 40, 41*).—The drying of hops in Oregon is briefly noted and an unsuccessful attempt to hasten drying by means of artificial draft in the ventilating shaft of the kiln is described. The failure was due to the inadequacy of the apparatus.

Improvement of oats by breeding, J. B. NORTON (*Hort. Soc. New York Mem., 1 (1902), pp. 103–109*).—This paper is a review of the work of improving oats by breeding. The method of making artificial crosses employed by the author is described.

Trials with potatoes at Danish plant experiment stations, F. HANSEN ET AL. (*Ugeskr. Landm., 49 (1904), Nos. 15, pp. 196–198; 19, pp. 239–241*).—Richter Imperator and Magnum Bonum seed potatoes of 4 different sizes, weighing 20, 30, 80, and 160 gm., were planted at intervals of 8 to 16 in. in rows 3 ft. apart. The average results for 6 years show that the largest seed potatoes gave the largest gross yield, but that the net yield was, in general, heaviest from potatoes somewhat above medium size and with a distance of not more than 12 in. between the potatoes in the row.

Trials with whole *v.* cut seed potatoes showed that, as a rule, the whole potatoes produced a heavier yield than where they were divided into half or quarter pieces. The potatoes were carefully cut and immediately planted. It was shown that larger tubers are likely to be obtained from cut seed than from whole potatoes of the same weight.—F. W. WOLL.

Analyses of potatoes grown in 1902, S. HALS and A. KAVLI (*Tidsskr. Norske Landbr., 10 (1903), No. 12, pp. 535–541*).—The average composition of 33 samples of potatoes grown in different parts of Norway in 1902 was as follows: Water 79.95, ash 0.88, protein 1.86, starch 14.27, other nonnitrogenous substances 2.52, and crude fiber 0.52 per cent. The fat was not determined. According to chemical analysis the potatoes contained 20.05 per cent of dry matter as compared with 19.2 per cent by calculation. The starch content by calculation was 13.4 per cent.—F. W. WOLL.

Sugar-beet culture, M. H. PINGREE AND W. FREAR (*Pennsylvania Sta. Rpt. 1903, pp. 28–37*).—These experiments, conducted in 1902, were in continuation of previous work (E. S. R., 14, p. 141). The beets were grown in 3 different counties. The average results show a sugar content in the beets ranging from 13.02 to 18.37 per cent. In the entire series of samples only 2 fell below the usual purity requirement. The weight of beets in the samples varied from 0.2 to 1.1 lbs. and averaged 0.62 lb. The size of the beets was too small for a profitable yield.

The temperature and rainfall for the season, and the field and laboratory results are given in tables. The work of each individual grower is briefly described.

Trials with sugar beets, 1904, F. W. WOLL, R. A. MOORE, and A. L. STONE (*Wisconsin Sta. Rpt. 1904, pp. 321–326, pl. 1, dgm. 1*).—The work with sugar beets this season was in cooperation with the Bureau of Chemistry of this Department and was conducted to study the influence of environment on the sugar beet. The crop on the different plats followed sugar beets, soy beans, and crimson clover.

Washington-grown Kleinwanzleben seed and seed kept over from the year before, showing 160 and 107 per cent of viable seeds, respectively, was planted at the rate of 20 lbs. per acre. Hot sultry weather in August turned the lower leaves yellow, but later the plants took on new life. Samples taken from September 20 to October 17 contained 12.77, 12.64, 12.33, 13.48, and 13.32 per cent of sugar for samples 1 to 5, respectively. The estimated yields of beets per acre ranged from 21.32 to 28.77 tons and the yields of sugar from 6,124 to 8,609 lbs. The results at harvesting time showed an average calculated yield of 25.04 tons of beets and 7,340 lbs. of sugar per acre and an average sugar content of 14.63 per cent in the beets. The total leaf production was at the rate of 7 tons per acre. The removal of dirt by washing the beets caused a loss of 6 per cent in weight.

The new seed produced an average yield of 25.79 tons of beets and 7,518 lbs. of sugar per acre, and the old seed 22.70 tons of beets and 6,807 lbs. of sugar. The average percentage of sugar in the beets from the new seed was 14.6, and from the old 15. The smaller tonnage from the old seed was due to its lower germination. The average yield of sugar beets at the university farm from 1890 to 1904 was 17.37 tons and of sugar 4,900 lbs. per acre, the average percentage of sugar in the beets being 14.1. The differences in the yields of the various plats were apparently due to a difference in soil. In the experience of the station strong and healthy beets may be grown on the same land during successive seasons if the climatic conditions are favorable and the soil is highly fertile.

Improvement of the sugar cane by selection and cross fertilization, D. Morris (*Hort. Soc. New York Mem., 1 (1902), pp. 79-87, fig. 1*).—This paper points out the objects sought and the methods employed in the improvement of sugar cane, and reviews the principal results obtained. In the lines of work discussed an increase in the yield of sugar is accomplished by increasing the weight of cane produced per acre, by increasing the quantity of sucrose in the juice with a reduction in the percentage of impurities, and by obtaining canes free from the attacks of diseases and insect enemies.

The methods of securing improved varieties include the introduction and experimental cultivation of selected canes from other countries, the experimental cultivation of canes arising from bud variation, the chemical selection of tops from individual canes or from stools high in sugar content, and the production of new varieties by cross fertilization and selection.

The characters which largely determine the ultimate industrial value of a variety are given as follows: "*Field characters*—sprouting power of bud and ability of cane to establish itself soon after planting; behavior and adaptability under extreme conditions of dryness and moisture; habit of cane, whether upright or recumbent; power of resisting the attacks of insect or fungoid pests; early maturity; productive power, estimated by the number of tons of cane yielded per acre; weight and character of tops for fodder purposes; readiness to produce successive crops from the same stools—that is, 'rattooning' power. *Factory characters*—the milling qualities of the cane, whether tough or brittle, when presented for crushing; fuel-producing properties; the relative percentage of expressible juice; the richness of the juice in sucrose; the purity of the juice—that is, the absence of glucose, etc."

Varieties of cane, C. F. Eckart (*Hawaiian Sugar Planters' Sta. Rpt. 1904, pp. 31-35*).—The work with varieties of sugar cane at the experiment station and laboratories of the Hawaiian Sugar Planters' Association, previously reported (E. S. R., 14, p. 565), is here reviewed as a press bulletin. The deterioration of varieties is discussed and the results obtained with newly-introduced canes are noted.

During 1902-3, 17 varieties were harvested and their sugar production per acre compared. The yield of sugar ranged from 12,307 to 26,540 lbs. per acre, the leading canes in the order mentioned being Demerara No. 117, Cavengerie, Striped Singapore, Queensland No. 1, Yellow Caledonia, Louisiana Purple, and Queensland No. 7, all of which yielded over 21,000 lbs. of sugar per acre. The analysis of the juice of these varieties is given in a table.

Recent experiments with saline irrigation, C. F. Eckart (*Hawaiian Sugar Planters' Sta. Rpt. 1904, pp. 37-41*).—Previous results along this line have been noted (E. S. R., 15, p. 960). The experiments are described and the results given in tables. It is concluded from the observations that lime is potent in modifying the deleterious effect of saline irrigation on the growth of cane.

The use of ground coral and gypsum in quantities furnishing 2 tons of lime per acre resulted in a gain of sugar amounting to 46 per cent where the irrigation water contained 200 grains of salt per gallon. A gain of 88.1 per cent of sugar is reported as being obtained by a 5-in. irrigation every eighth watering, and it is believed that 77 per cent of this gain is attributable to the leaching of salt accumulations from the soil by this heavy application of water.

Tobacco investigations—preliminary report, E. P. Sandsten (*Wisconsin Sta. Rpt. 1904, pp. 243-251, figs. 3*).—A report is given on work in the improvement of Wisconsin tobacco seed and on fertilizer experiments. In order to improve the quality and yielding capacity, and to obtain early maturity, a strain of Wisconsin-grown Connecticut Havana seed-leaf was selected and an acre was planted for seed production. Only the plants presenting the highest type were allowed to mature, and the seed obtained was distributed to growers with satisfactory results. This season the result of the previous year's selection was shown on 2 acres of tobacco

grown from selected seed, the stand being very even and the plants typical in all respects. The seed from these 2 acres is again to be distributed.

Fertilizer experiments were conducted during the season on two farms. The land on one of the farms had been heavily fertilized with barnyard manure for several years, and here there was a gain of only 320 lbs., or 28.5 per cent, in the yield of leaf from the use of 150 lbs. each of nitrate of soda, sulphate of potash, and acid bone, as compared with 10 tons of barnyard manure per acre. On the second farm commercial fertilizers showed a distinct gain in every case over the barnyard manure, the greatest increase, amounting to 437 lbs., or nearly 46 per cent, being obtained on a plat receiving 200 lbs. of dried blood per acre.

These results are not considered as conclusive, but are believed to indicate that commercial fertilizers can be used with profit in tobacco culture on some soils. The experiments also served to point out the lack of certain plant food elements, the results of the second farm showing plainly the great benefit derived from supplying nitrogen to that particular soil.

Experiments are also in progress with hairy vetch as a cover crop for maintaining the fertility of tobacco lands. The vetch was sown the last week of July at the time of the last cultivation, and made a good growth. The experimental work in growing Sumatra tobacco under cover in Wisconsin is briefly noted, but the final results are to be published later.

Opportunities for the production of cigar-leaf tobacco in East Texas and Alabama, M. Whitney (*U. S. Dept. Agr., Bureau of Soils Circ. 14, pp. 4*).—This circular reports briefly surveys of soils in Texas and other southern States, and a study of the relations of the quality of the leaf to the soil producing it.

It was found that upon a reddish or grayish sandy loam with a red clay subsoil, designated as Orangeburg sandy loam, a leaf much finer in aroma than the leaf grown on other soil types in the area was produced. This type of soil was found in different counties of Texas and in Alabama, South Carolina, Georgia, Florida, Mississippi, and Louisiana. In 1903 and 1904 experimental crops of tobacco were grown on the Orangeburg soils in several localities of Texas and in Alabama and South Carolina with promising results.

Report on turnip experiments, 1903–4, J. Hendrick and R. B. Greig (*Aberdeen and North of Scotland Col. Agr. Bul. 1, pp. 47*).—The experiments conducted on 5 farms included fertilizer tests, chemical and mechanical analyses of soils, and a comparison of varieties with reference to their yielding capacity and composition.

The average results on 4 farms showed that phosphoric acid was of predominating importance, but that the value of potash for turnips was not so clearly indicated. Basic slag, bone meal, and ground mineral phosphate were less effective than superphosphate, decreasing in value in the order mentioned. Commercial fertilizers given in addition to an application of 15 tons of barnyard manure per acre did not prove profitable, and neither did the use of 20 tons of manure alone, as compared with 15 tons, pay for itself in the first year.

The application of ground lime gave an average decrease of 6 cwt. per acre. On one of the farms poor in available lime the use of the ground lime increased the crop by nearly 50 cwt. per acre. It is stated that in order to benefit turnips lime must be thoroughly worked into the soil several months before drilling the seed. The largest profits in the entire series of experiments were obtained from an application consisting of 1½ cwt. of nitrate of soda, 4½ cwt. of superphosphate, and ¾ cwt. of sulphate of potash per acre; and the same application without the nitrate of soda gave returns almost as good.

Five varieties of yellow turnips contained on an average 8.77 per cent of solids and 4.05 per cent of sugar, and 7 varieties of swedes, 10.26 per cent solids and 5.12 per cent sugar. Among these 12 varieties Sittyton Purple Top stood first in the production of dry matter, with a yield of 2 tons 3 cwt. 30 lbs. per acre.

In another experiment the cropping capacity of a number of varieties was compared. Among 12 varieties of swedes Webb Imperial and Sutton Magnum Bonum stood first, with yields of 20 tons 1¼ cwt. and 20 tons 50 lbs., respectively, and among 4 varieties of yellow turnips Challenger and Sittyton Purple Top, with 24 tons 2¾ cwt., and 23 tons 2½ cwt., respectively. The 12 varieties of swedes contained on an average 10.94 per cent of dry matter and 7.44 per cent of sugar. The results of chemical and physical analyses of the soils are shown in a table.

Wheat raising on the plains, J. E. PAYNE (*Colorado Sta. Bul. 89, pp. 25-30*).—The history and development of wheat culture in eastern Colorado are reviewed and the methods of soil preparation and seeding are described. Notes are also given on the use of the straw and the magnitude of the wheat-growing industry on the plains.

Analysis of wheat grown under irrigation, F. W. TRAPHAGEN (*Montana Sta. Rpt. 1903, pp. 35-37*).—Analyses of wheat were made to determine the influence of irrigation upon the composition. The results indicate that under ordinarily careful irrigation the protein content is not appreciably reduced, and that under careful irrigation it may be actually increased. The data are given in tabular form. In addition, analyses of barley, clover, alfalfa, Canada field pea, and flour are also reported.

Studies on the development of the wheat and rye plant, B. SCHULZE (*Landw. Jahrb., 33 (1904), No. 3, pp. 405-441*).—After 6 months of winter growth rye plants weighed over 12 times as much as they did at the beginning of the period in November. The dry matter during this period increased slightly more than the water content.

Among the substances elaborated during the winter the nitrogen-free substances ranked first. The percentage of these substances in the dry matter of the plant was considerably higher in the spring than in the fall. The increase in mineral constituents during this time remained nearly parallel with the increase in dry matter. Nitrogen assimilation was carried on at a lower rate, so that the percentage of nitrogen in the dry matter was lower in the spring than in the fall.

The relation of proteid and amid substances in the fall and the spring was about the same. Practically the whole supply of amids in the roots passed into the upper part of the plant during the winter. The elaboration of material within the plant was most active during the interval from heading to blossoming. Under the present conditions this interval consisted of 28 days, during which more than 60 per cent of the dry matter present at blossoming had been elaborated. Apparently no assimilation of nitrogen, phosphoric acid, potash, and sulphur took place after the heading of the plants. In the newly elaborated material for this period the carbohydrates again ranked first.

Of the total increase in dry matter, amounting to about 157 gm. for 100 plants, approximately 130 gm. or 83 per cent consisted of nitrogen-free extract and crude fiber. The supply of amid substances and fat was greatest at the time of heading. The proteids increased rapidly during this period and considerable quantities of ash constituents were also taken up. The moisture content reached its height when the plants were heading.

From heading until blossoming the 100 plants showed a gain of 63 gm. in dry matter, consisting practically all of nitrogen-free substance, including crude fiber. Some proteid substance was built up from amids, and a small quantity of lime and magnesia was also taken up. The assimilation of carbon and the translocation of substances to the growing parts are considered the principal activities of the plant organism during this period. It is believed that after blossoming the rye plant is not at any time very active in withdrawing plant food from the soil. The translocation of substance consisted in the movement of amids and mineral substances from the roots to the parts above ground, the amids being there largely replaced by proteid substances. The readily soluble alkali sulphates and phosphates moved fastest, as the comparatively heavy content of these substances in the developing heads of rye would go to show.

The distribution of water was quite uniform in all parts of the plant up to the time of heading, when the percentage of moisture in the part above ground began to fall below that of the root system. The water content of the entire plant, however, decreases from the beginning of growth in the fall, the rate of decrease being very low until spring, when the reduction goes on more rapidly as the plant develops. During the progress of growth the percentage of dry matter, nitrogen-free extract, and crude fiber increases, while the percentage of water, nitrogen, proteid substances, amids, fat, and ash decreases.

In the corresponding experiments with wheat it was found that 100 plants on April 22 weighed 6½ times as much as they had weighed at the end of October. The increase in weight was equally divided between dry matter and water, and was greater in the part of the plant above ground than in the roots. The percentage of nitrogen-free extract and crude fiber was much higher in the spring than in the fall, and consequently these substances took part in increasing the weight of the plant. The mineral constituents also showed an increase corresponding to the increase in dry matter. The assimilation of nitrogen did not keep pace with the production of dry matter. The nitrogen taken up was used more extensively in the formation of proteids than of amids. During this period the amid supply of the roots moved into the portions above ground.

From the beginning of further development in the spring until the heads appeared, a period of 55 days, assimilation of plant food was carried on very actively. Eighty per cent of the dry matter elaborated during this period consisted of nitrogen-free extract and crude fiber. The amids were transferred from the roots to the upper portion of the plant, where they were transformed into proteid substances. The mineral substances were translocated in the same manner.

After the amids have been removed the roots of both wheat and rye seem to act during winter as storehouses of nitrogen-free substances. The heads in the early stage of their formation were relatively rich in nitrogen compounds, especially amids, and in readily soluble potassium phosphate. In the spring the roots contained a little less moisture than in the fall and the reduction of the moisture content of the plant in its relation to dry matter began with growth in the spring. As in the case of rye, a percentage increase occurred only in the dry matter, the nitrogen-free extract, and crude fiber, while the percentage of ash and of sulphuric acid, lime, and magnesia in the dry matter remained constant. All other constituents decreased in percentage content as the plant developed.

In comparing the results with the two crops it was found that at the close of winter the rye had taken up almost one-half of its nitrogen content, while wheat took up most of its nitrogen from the end of April to the time the kernels began to form. Wheat continued to take up nitrogen when the plants were heading, while rye no longer took up this element from the soil at this stage. This shows that rye should be provided with readily soluble nitrogen compounds during the winter, and that both cereals should be given an abundant supply at the beginning of growth in the spring. Phosphoric acid was taken up during the period of intensive spring growth and until the plants headed out, with perhaps, in the case of wheat, until blossoming.

Potash was used by both crops during the winter, but the largest quantities of this element were used from the beginning of growth in the spring until the heads appeared. The greatest use of potash was simultaneous with the most active formation of carbohydrates and cellular tissues. Lime and magnesia were used in only small quantities by the young plants, but the needs for these substances increased as the plants developed, and it is believed that this greater need is connected with the hardening of the tissues.

The cereals in America, T. F. Hunt (*New York: Orange Judd Co.; London: Kegan Paul, French, Trubner & Co., Ltd., 1904, pp. 421, pl. 1, figs. 149*).—This book,

intended for the general reader and the agricultural student, is a treatise on the cereal crops, principally with reference to their American environment.

The purpose of the work is to present "a fairly comprehensive, although concise, statement of experimental results as well as of farm methods relating to the cereals in America." The crops discussed are wheat, maize, oats, barley, rye, rice, sorghum, and buckwheat, several chapters, as a rule, being devoted to each one. The different topics treated under each crop are structure; composition; botanical relations; classification and improvements of varieties; climate; the soil and its amendments; cultural methods; weeds, fungus diseases, and insect enemies; harvesting and preservation; uses and preparation for use; production and marketing; and history.

Examining and grading grains, T. L. Lyon and E. G. Montgomery (*Nebraska: Authors, 1904, pp. 64, figs. 16*).—The classification of species and varieties, a description of characters with outlines for the same, and an enumeration and discussion of points to be observed in grading and judging, are given for wheat, corn, oats, and barley. An outline for use in studying the common cultivated grasses, hay and straw inspection rules, and grain weights per bushel for 56 different farm crops are also presented.

Methods of cereal breeding in Kansas, H. F. Roberts (*Hort. Soc. New York Mem., 1 (1902), pp. 179–183*).—This paper deals mainly with the work of breeding corn and wheat at the Kansas Experiment Station. The experiments have now also been extended to cover rye, oats, barley, Kafir corn, soy beans, and cowpeas.

HORTICULTURE.

Report of the horticultural department, J. Troupe (*Indiana Sta. Rpt. 1904, pp. 16–18*).—A review is given of the work of the department during the year, with the results of some experiments in grafting and in forcing vegetables. In an experiment to determine the reciprocal action of scion and stock, scions of Yellow Transparent apple were inserted into branches of the wild crab. After fruit spurs were formed on the Yellow Transparent scion, all the leaves from the scion were removed so that all of the sap was elaborated by the leaves of the wild crab. "At the same time a scion of the same Yellow Transparent tree was inserted into a twig of the same branch and allowed to form its own leaves." The fruit produced on the scions thus treated was practically alike in size, color, and flavor, and in both instances the fruit was clearly Yellow Transparent.

Experiments in grafting apple on whole or piece roots have now been under way at the station for a number of years. Some of the trees have borne fruit. Up to the present time it is difficult to detect any difference in the size of the different trees treated. "It seems to be practically settled that each variety will form its own root system regardless of the length of root used as a starter."

In some tomato forcing experiments a test was made of the relative value of sub *v.* surface irrigation, and also garden soil *v.* light sand. The three varieties, Burpee Combination, Success, and Stone, were used. The results obtained are given in condensed form. The heaviest yields in every case but one was produced by subirrigation. The variety Combination produced more fruits by surface irrigation, but the average weight was less than by subirrigation.

"The yield in sand was less in every case, and the weight below those in garden soil." Fruit ripened about a week earlier on the surface-irrigated plats than on the subirrigated plats.

The variety Success was pollenized with pollen obtained from itself and from Combination and from Stone. The yield of Success when pollenized by itself was 187 fruits; when pollenized by Combination, 149 fruits, and when pollenized by Stone, 196 fruits. The fruits were of practically equal size in all cases. The results indicated that success in tomato forcing may be governed to a considerable extent by the variety of pollen used in cross fertilization.

Horticultural department, R. W. Fisher (*Montana Sta. Rpt. 1903, pp. 53–63*).—A summary is given of the work of the year, with data as to the yields of a number of varieties of vegetables and apples. The last spring frost occurred at the station May 24, and the first fall frost September 11. The frost of September 11 did considerable damage to all tender vegetables. Cultivated plums were materially damaged, although wild plums and apples were not affected to any appreciable extent.

The average yields of a number of varieties of apples for two years indicate the varieties Wealthy, Yellow Transparent, Okabena, Hibernal, and Duchess, in the order named, as the heaviest yielders. With crab apples, Transcendent heads the list, the yield being nearly three times greater than that of its nearest competitor, the Orange variety. Orchard experiments at the station indicates that trees should not be set closer than 20 ft. apart in that region.

Lima beans have uniformly failed at the station. The yields of 44 varieties of bush beans are recorded. The heaviest yielding varieties in order were White Seeded Wax, Davis Wax, and Long Yellow Six Weeks. Succession has proved the best early variety of cabbage, and Late Stonehead and Danish Round Head the best late varieties. With cauliflower, the Best Early variety was ready for use about one week before Dry Weather. Early White Cob Cory has proved the best variety of sweet corn tested at the station. It matured a full crop, while Cosmopolitan matured about 30 per cent, and Crosby Early 50 per cent of a full crop. With beets, Improved Blood Turnip gave the earliest and largest yield of a number of varieties tested. Thorburn New Everbearing was the earliest and best pickling cucumber grown.

A test of transplanted *v.* field-sown onions showed an average yield of 13,939 lbs. per acre for the field-sown onions, and 32,334 lbs. per acre for the transplanted onions. The author is of the opinion that it does not take any more labor to transplant seedlings from a flat or hotbed than it does to thin field-sown plants. The yields obtained with a number of varieties of onions are tabulated. Twelve varieties of tomatoes were grown. The station experiments with this crop indicate that the most ripe fruits can be obtained by planting on moderately heavy clay soil. By frequent cultivation and the use of plenty of water early in the season, the plants can be forced into early growth; and by the withdrawing of these later in the season the fruits can be induced to mature earlier than they otherwise would.

Report of the horticulturist, G. C. Butz and J. P. Pillsbury (*Pennsylvania Sta. Rpt. 1903, pp. 183–214, pls. 3, figs. 3*).—A general review of the work of the year, with a detailed account of an experiment in ginseng culture and a record of the yields of a number of varieties of strawberries, raspberries, blackberries, currants, and gooseberries. The article on ginseng is practically a reprint of Bulletin 62 of the station (E. S. R., 14, p. 861), some further notes and illustrations being given on how the ginseng plant gets out of the seed.

The tabular matter relating to strawberries shows the date of flowering of the different varieties, first and last ripe fruit, tendency to disease, vigor, tendency to form runners, date of largest picking, and the relative yields when grown in hills and in matted rows. The fruit averaged .37 gm. larger when grown in hills than when grown in matted rows. Descriptions are given of 29 varieties of strawberries, 16 of raspberries, and 5 of gooseberries.

Some experiments of Luther Burbank, D. S. Jordan (*Pop. Sci. Mo., 66 (1905), No. 3, pp. 201–225, figs. 21*).—An illustrated account is given of a large number of flower, fruit, nut, grass, and grain creations of Luther Burbank, during recent years, with extensive notes on Mr. Burbank's views concerning the methods and philosophy of hybridizing.

Mr. Burbank believes that "mutations can be produced at will by any of the various means which disturb the habits of the plant." Variations can usually be fixed in 5 or 6 generations, and sometimes at once. "There is no evidence of any limit in the production of variation through artificial selection, especially if preceded

by crossing. . . . By crossing different species we can form more variations and mutations in half a dozen generations than will be developed by ordinary variation in a hundred or even a thousand generations. . . .

"The evolution of species is largely dependent on crossing the variations contained within it. Forms too closely bred soon run out, because generally only by crossing does variation appear. It is of great advantage to have the parents a certain distance apart in their hereditary tendencies. If too close together, there is not range enough of variety. If too far apart, the developed forms are unfitted for existence, because too unstable. Correlated changes work together to produce the effect of mutations. . . . Radical changes of environment for a series of generations will produce a tendency to sport, but hybridization will bring it about far more abruptly and, for practical plant or animal breeding or for scientific study of all these variations, far more satisfactorily."

Mr. Burbank has produced a number of species by hybridization which he believes to be as good as nature itself has produced. It is asserted that there is a close analogy between hybridization and grafting. An instance is cited in which *Prunus myrobalana* var. *pissardi* was imported from France and grafted on the Kelsey plum, a variety of *Prunus triflora*. The graft did not bloom, but its presence on the tree brought about a cross between the two species. Many hundred descendants of this cross are now living.

In one sense hybridization is believed to be only a mode of grafting. A diagram is given showing the zone of life and parallelism of results in crossing and grafting. Mendel's law which holds good for the tribe of peas has not been found to be generally true so far as Mr. Burbank's experiments go.

The results of crossing are sometimes very simple, and at other times are so complicated that to follow them requires the highest skill, and even then may be utterly impossible.

An instance is cited in which a Siberian Rubus (*R. cratægifolius*) was crossed with a California blackberry (*R. vitifolius*). Some of the hybrids obtained combine the best qualities of both fruits, and out of over 5,000 second generation seedling every one has proved true to seed. A hybrid red poppy was obtained by uniting the opium poppy with the oriental poppy. The second generation hybrids thus obtained all prove perennials, and blossom every day in the year, while the parents are annuals and blossom only for a few weeks. The hybrid poppy produces no seed. New spineless cacti for stock-feeding purposes have been secured by crossing together 5 species of Opuntia.

It is stated that crosses are sometimes more vigorous than their parent, and at other times the reverse is true. A peach-almond cross is cited, in which the hybrid produced a tree ten times as large as either parent of the same age.

Heredity, L. BURBANK (*Amer. Florist, 24 (1905), No. 872, pp. 149, 150*).—A paper presented at the meeting of the American Breeders' Association, held at Champaign, Ill., February 1–3.

Heredity is defined as "the sum of all the effects of all the environments of all past generations on the responsive ever-moving life forces." Crossing is stated as the grand principal cause of all the species and varieties of earth, sea, and air. Relative to the formation of acquired characters, the author states that "similar environments produce similar results on the life forces, even with the most distantly related plants or animals. This fact alone should be proof enough, if proof were still needed, that acquired characters are transmitted."

The parallelism of grafting and hybridizing is pointed out. "Grafting or budding may be called a bio-mechanico-chemical combination. While crossing by seed is more of a bio-chemical union, yet this last union is often more truly mechanical than chemical as in the case of a mosaic union, which is not unusual when the cross is too abrupt. In fact, every gradation from a purely mechanical union to one of per-

fect chemical blend is a common everyday occurrence with those who have carried out field experiments on a broad and comprehensive scale."

Free distribution of experiment station seeds, B. D. HALSTED (*New Jersey Stas. Bul. 179, pp. 18, pls. 4, fig. 1*).—Five vegetables originated by the station have become well enough established to be sent out to farmers. These are the Station Bush Lima bean, Kelsey Bush Lima bean, the Station Yellow tomato, the Jersey Belle eggplant, and the Voorhees Red sweet corn. These are described and illustrated. In addition the station is sending out 3 other kinds of corn for testing in the State. Notes from farmers who have grown the Voorhees Red sweet corn are included. The origin and characteristics of the different vegetables originated at the station have been noted from its earlier bulletins and reports (E. S. R., 16, p. 464).

Forcing beans, C. A. VALLEJO (*Wisconsin Sta. Rpt. 1904, pp. 261–270, figs. 4*).—The results are given of experiments in growing beans under glass. The author considers that there is no advantage in starting beans in pots, as is often advised. It is rather a waste of time and labor. Better results were secured when beans were planted in hills about 1 ft. apart each way, than when planted about 3 in. apart in drills 30 in. apart. Much better results were secured when they were thinned to stand 18 in. apart in the row than when they were left unthinned.

The yield of beans was increased about three times by the use of complete commercial fertilizers. Two varieties of beans were grown, Ne Plus Ultra and Golden Eyed Wax, the former of which was much the more productive. Tobacco smoke used for fumigation was found to seriously injure the plants. The white fly (*Aleurodes vaporium*) was easily controlled by fumigating with hydrocyanic-acid gas, using 10 oz. of potassium cyanid for about 6,000 cu. ft. of space. It is believed that nothing is gained by giving the plants too much heat, for while they come to maturity a little earlier the yield is much less than where the temperature is lower. About 50 to 60° F. at night and 70° F. in the day time are believed to be about the right temperatures.

Forcing tomatoes, W. J. GREEN and C. W. WAID (*Ohio Sta. Bul. 153, pp. 27, figs. 12*).—The station has not found it profitable to grow a crop of tomatoes in midwinter in Ohio. The prices which can be obtained for them are not high enough, and the quantity that can be disposed of is too limited. The crop has proved profitable, however, as a spring and early summer crop. At such seasons tomatoes have proved more profitable than either lettuce or cucumbers during the same period.

The price received for tomatoes grown in the greenhouse has usually been considerably higher than the price paid for southern tomatoes in the market at the same time, the quality being better when allowed to ripen in the greenhouse than when the tomatoes were shipped in a green state from the South. Tomatoes at the station are usually grown on raised benches with about 6 in. of soil, since they have been found to mature earlier there than in solid beds. The average yield up to 1903 has been at the rate of 2 lbs. 4 oz. per square foot, or 9 lbs. of fruit to a plant. The plants have usually been grown 2 ft. apart each way. The price has varied from 5 to 20 cts. per pound, averaging about 12 cts. per pound. In 1904 the first picking was secured June 10, and up to August 1 the value of the fruit had averaged 20 cts. per square foot.

An experiment was made in subirrigation *v.* surface-watering tomatoes in the greenhouse. In the experiment the yield of fruit per square foot in the subirrigated beds was 2 lbs. 4½ oz. The fruit had an average size of 5.9 oz., and the amount of rot per square foot was 1.9 oz. In the surface-watered bed the yield of fruit per square foot was 1 lb. 15 oz., the average size of the fruit 5 oz., and the amount of rot 4.7 oz. per square foot. No mulch was used in either case. Particular attention was given to supplying the amount of water needed for the best development of the plants in each case. More water and more time was required to surface-water than to subirrigate. The authors state that "mulching with strawy

manure accomplishes the same results as subirrigation. It is more beneficial, however, with surface than with subwatering."

Two experiments are recorded in testing different distances and methods of training tomatoes in the greenhouse. In the first experiment some of the plants were set a foot apart each way and trained to 1 stem. Others were planted $1\frac{1}{2}$ ft. apart each way and trained, some to 1 and some to 2 stems. Other plants were set 2 ft. apart each way, and some trained to 1 and some to 2 stems. The largest yield per square foot of space was obtained by setting plants 1 ft. apart each way and training to 1 stem. The fruit thus grown, however, was about an ounce lighter, on the average, than where the plants were set at a greater distance. The plants set $1\frac{1}{2}$ ft. apart and trained to 2 stems stood second in yield. The lowest yield and the largest amount of rot occurred where the plants were set 2 feet apart each way and trained to 2 stems.

The experiment was repeated, using a much greater amount of space, and the two varieties of tomatoes, Stone and Beauty, were grown. The yield of fruit on different dates and the total yield are tabulated. The results were not quite uniform with the 2 varieties. "The thick planting gave the best yield with the Stone, but the result was less marked with Beauty. Each variety, however, showed a marked advantage for the thick planting over the thin, so far as early maturing is concerned."

This is a point of considerable importance, since the best prices were secured with the fruit early in the season. Considering the matter from this standpoint, the close planting was a decided advantage with both varieties. With the Stone variety particularly, the early ripening was not only marked, but the total yield was much in favor of thick planting. Further experiments along the same line will be made.

A test of 32 varieties of tomatoes was made during the season, and the data as to early and total yield and average size are recorded for each variety. Brief descriptions are also given for all but 5 of the varieties. The fruit of 12 varieties is illustrated.

The bulletin contains directions, based upon the experiments at the station, for the care of tomatoes in the greenhouse, on the insects and diseases affecting them, on methods of marketing, and on varieties. It has been found desirable to sow the seeds in flats about the first of December. Where the time is limited, the plants are transplanted from the flats into $2\frac{1}{2}$-in. pots, and later into 4-in. pots, where they remain until ready to be planted in the beds. With proper care they should be ready for bedding by the middle of March.

Coarse wool twine has been found most satisfactory as a support on which to train the vines, and raffia the most satisfactory tying material. The severe pruning which it is necessary to give tomatoes in the greenhouse sometimes causes the fruit spurs to send out suckers. These should be removed. The white fly has been the most serious insect pest with which the authors have to contend in this work, and the leaf blight (*Cladosporium fulvum*) the most serious disease. This disease has been controlled when Bordeaux was used early in the work. In marketing, the fruit is carefully graded and sold in 5-lb. baskets.

Culture of fruit trees in pots, J. Brace (*London: John Murray, 1904, pp. XII+110, pls. 9, figs. 22*).—Popular directions for the construction and furnishing of fruit houses and for the culture of peaches and nectarines, apricots, plums, cherries, apples, pears, figs, grapes, and mulberries in pots. Chapters are also given on fungus diseases and insect pests of these fruits, a calendar of operations in the unheated house in each month of the year, etc.

Evaporation of water from apple trees during the winters of 1902–3 and 1903–4, E. P. Sandsten (*Wisconsin Sta. Rpt. 1904, pp. 258–260*).—In order to determine the amount of evaporation which takes place from fruit trees in winter, the author sawed off 4 8-year-old apple trees close to the ground and placed them in an upright position in the orchard. The trees were weighed immediately after

they were cut off, in December, and from time to time during the winter until the following April.

During the winter season of 1902-3 the amount of water lost was from 15 to 20 per cent of the total weight of the trees. The following winter, however, was more moist, and there was a larger number of cloudy days, as a result of which there was a loss of only about 2 per cent of the total weight of the trees. The author is of the opinion that low temperature is not the chief cause of the winterkilling of fruit trees in Wisconsin. "Low temperature is not necessarily fatal to fruit trees, providing the rainfall and the humidity are sufficiently great. Then, too, the condition of the trees and the amount of moisture in the soil in the fall have much to do with the question."

Nomenclature of the apple; a catalogue of the known varieties referred to in American publications from 1804 to 1904, W. H. Ragan (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 56, pp. 383*).—The main purpose of this bulletin is to bring together in one comprehensive volume all known names that have appeared in American literature of the apple. The revised rules of the American Pomological Society have been followed in compiling the list.

The list is alphabetically arranged, and includes both the leading names of the different varieties and the various synonyms under which they are known. The leading names are in each instance followed by citations of the authors first using them. The data given in addition to the name and synonyms of each variety relates to the origin, form, size, color, flavor, quality, use, and season of the fruit, the texture and color of the flesh, etc. A bibliography of the literature consulted, comprising 233 papers, is appended.

"It is believed that this publication will be especially useful in correcting and simplifying the nomenclature of the apple now well known to be in more or less confusion, and that it will become a standard guide in the naming of varieties in the future. To nurserymen who should desire correct names for their varieties, and especially to originators, who would avoid the serious mistake of duplicating names in bestowing them on their new products, this list must come as a valuable aid and helper."

Grass mulch for apple orchards, F. P. Vergon (*Rural New-Yorker, 64 (1905), No. 2874, pp. 137, 138, fig. 1*).—The author describes his system of growing apples in sod and of mulching the trees with the grass cut in the orchard or hauled in from other sources. He believes that this system of apple growing is cheaper than cultivation each season; the soil in the orchard grows richer, and the color and keeping quality of the fruit is improved. The average production of the author's 16-year-old orchard is stated to be from 10 to 20 bu. of sorted fruit per tree annually.

Cover crops, E. P. Sandsten (*Wisconsin Sta. Rpt. 1904, pp. 252-257, figs. 2*).—The severe climate of Wisconsin with long, cold, and dry winters is very trying on fruit trees. During the winter the ground freezes deeply, which prevents the roots from absorbing moisture to supply that evaporated by the trunk and branches above the ground. As a result of this evaporation the bark of many varieties often becomes shriveled and dry.

In order to determine the relative protective value to the soil from freezing a test was made of a number of different cover crops. The depth to which the ground froze under these various crops was as follows: In orchard under clean culture and the soil left unprotected during the winter, 16 in.; under cover crop of oats, 8 in.; under cover crop of hairy vetch, 7.5 in.; under cover crop of rape, 15 in., and under cover crop of blue grass sod, 18 in.

The ground froze deepest under a cover of blue grass sod, while hairy vetch proved the most efficient of the different cover crops tested in protecting the ground from frost. The author recommends hairy vetch as the best all around plant for cover crops. Oats have given good satisfaction and are recommended in preference to

rye. They should be sown not later than August 10 in order to obtain sufficient growth to catch and hold the snow during the winter.

From the experience of two winters, the author is firmly of the opinion that much of the winterkilling of fruit trees in Wisconsin can be prevented by the aid of cover crops.

A side light on cover crops, U. P. HEDRICK (*Rural New Yorker, 43 (1904), No. 2862, p. 858, figs. 2*).—An experiment was made to determine the relationship between various herbaceous plants used as cover crops and the peach. The tests were made in 16-in. pots.

It was found that when certain plants, like oats, blue grass, mustard, and potatoes, were used as cover crops for seedling peaches, the trees ripened their wood long before there was sufficient frost to injure the foliage. When, however, such plants as crimson clover, peas, and beans were used as cover crops, the leaves remained on the trees green and luxuriant until killed by severe frost November 1. These legumes proved a perfect failure so far as ripening the wood and preparing the trees for winter were concerned.

An examination of the root growth in the various pots showed that the root systems of the trees and the plants in the first-named group were not at all intimate. "The roots of the 2 plants scarcely came in contact with each other, but the roots of the clover and the peach were so intermingled that they were matted together, and could not be easily separated."

The practical side of the question seems to be that legumes are not good cover crops when the object is to cause trees to ripen their wood. The author is of the opinion "that peach trees would suffer more in a cold winter with a legume as a cover crop than without a catch crop of any kind. The experience of peach growers confirms this opinion. For a cover crop to hasten the maturity of the tree, instead of a legume, one of the cereals, as oats or rye, would certainly answer the purpose much better."

Preliminary report on cranberry investigations, A. R. WHITSON ET AL. (*Wisconsin Sta. Rpt. 1904, pp. 220–242, figs. 5*).—General consideration is here given to the conditions required for cranberry growing, the soils on which they succeed best, water supply, amount and kind of water to be used, storage of water, depth of water in reservoirs, loss of water by seepage and evaporation, location of reservoirs, size of flooding ditches and location of reservoir with reference to planted ground, drainage of the plantation, protection from frost, weeds and methods of dealing with them, cranberry diseases, varieties, and methods of harvesting and keeping. It is proposed to publish a bulletin on this subject which will take up various agricultural phases more in detail.

Relative to soil, the author states that peat soil is by far the most desirable. An experiment is noted in which an attempt was made to determine the effect of lime carbonate in the water on cranberries. A thin layer of marl was spread over part of one of the plats in the early part of the summer. Up to the time of writing no influence was apparent in the growth of the vines or yield of berries as a result of this application.

In the construction or reservoirs it was found that "where 2 cuttings of peat were removed and the peat over sand was thereby reduced to a thickness of from 6 in. to 2 ft., the loss by seepage amounted to about 3 in. per day, when the depth of the water was 3 ft." It is believed that the loss of water by evaporation is greater when the reservoir is filled with vegetation than where only the free water is exposed.

Preliminary experiments in drainage indicate that when the water is kept in the ditches at a depth of 6 in. below the surface of the ground better results are secured than when the water is level with the surface of the ground or held 18 in. below it. Considering, however, the growth of noxious vegetation, as well as other factors, it

is believed that the drainage ditches should be deep enough to allow the reduction of the ground water level to a depth of 18 in. to 2 ft. below the surface of the marsh proper.

Relative to frost it is stated that in no month during the year can Wisconsin growers consider themselves free from this source of danger. The authors found that frost was influenced to a remarkable extent by such factors as the depth of sanding to which the marsh had been subjected, the thickness of vegetation, particularly the moss, etc. One night when the temperature over the marsh showed a general minimum of 25°, "small plats of ground which were well drained and sanded were entirely unaffected by the frost, while the berries on adjacent plats which were in a more moist condition and unsanded were entirely destroyed."

A list is given of about 20 species of weeds which are injurious in the cranberry marshes of Wisconsin, and some suggestions made as to methods for their eradication. In regard to spagnum moss and wood moss, it is stated that small applications of common salt or salts in commercial fertilizers will help exterminate these weeds. Sudden flooding of the bog and drawing off the water is also very injurious to these plants.

The cranberry scald is mentioned as one of the most serious diseases of cranberries, and the differences between the character of the disease in eastern marshes as compared with Wisconsin marshes are pointed out. The indications are that the fungus enters the vines and lives there perennially, from which it enters the berries. Spraying experiments with Bordeaux mixture for the control of blossom blight showed a gain of 30 bu. per acre over plats which were unsprayed.

Berries are picked both by hand and by raking, the price varying from 50 cts. per bushel by the former method to $1.50 to $2 per day by the latter. Considerable loss occurs in raking the berries from injury to the vines by breaking them and tearing them loose. Berries should be fully matured when harvested, but not overripe. If harvested and stored in a wet condition they do not keep well. Artificial drying should be resorted to if necessary.

The berries should be separated from the débris which is gathered with them as soon after harvesting as possible. The notion that they should be stored in chaff and moss to aid in coloring up is considered wrong. They color up as well without the débris as with it. Not much attention has been given to the cold storage of cranberries, but a barrel placed in cold storage in the fall was found to be in good condition the following August.

Varieties of strawberries, W. J. Green and F. H. Ballou (*Ohio Sta. Bul. 154, pp. 29–63, figs. 14*).—The results are given of tests during the year of 141 varieties of strawberries grown at the station. A table shows the sex of the different varieties, the blossoming period, period of ripening, yield, size of the fruits, and habit and health of the plant. Descriptive notes are given of a large number of the varieties tested.

Studies in fruit drying, A. L. Knisely (*Oregon Sta. Rpt. 1903, pp. 41–43*).—Apples and potatoes were peeled, sliced, and dried under varying conditions, and the results obtained are presented in tabular form. The essential features of the work consisted in dipping the apples and potatoes in salt solutions of different strengths and noting the effects upon the color and quality of the dried product. The slices varied from about one-eighth to three-sixteenths of an inch in thickness. In some cases the slices were dried immediately without any further treatment. In others they were dropped into cold water alone, and in still others into dilute salt solutions, varying in strength from one-fourth of 1 per cent up to 2 per cent.

The treatment with salt solutions was to see if this process would not give a well bleached product without the use of sulphur. In the case of sliced apples when the strength of the solution was 1 to 2 per cent, the product was very bright and white. With a lower percentage of salt in the solution they were more or less col-

ored. Dipping in cold water alone resulted in a slightly brighter colored product than no treatment, but the product was much darker than that from the salt treatment. Practically the same results were secured with sliced potatoes, the 1 and 2 per cent solutions giving a white and perfectly bleached product.

Apples and potatoes thus treated were put away in paper sacks and left in a damp building for some months. "The dried apples absorbed much moisture and had to be taken to a dry building, while the potatoes did not have a tendency to absorb moisture and remained dry and brittle." After 10 months' exposure to air and light the apples began to darken in color, though the potatoes kept their original brightness. It is believed that the potatoes would stand any climatic condition as they do not seem to absorb moisture, mold, or ferment. When the potatoes were soaked in cold water for 8 to 10 hours they resembled freshly sliced raw potatoes and cooked very nearly as well as when fresh.

An experiment in making Saratoga chips by cooking the dried potatoes without previously soaking them resulted in a failure. When the dried potatoes were first soaked for 8 to 10 hours and then cooked in hot lard a very good quality of Saratoga chips was produced. It is believed that potatoes thus preserved, while more bulky, make a much more appetizing food than the ground product.

Canning and evaporating fruit and vegetables, H. W. LAWRENCE and B. C. ASTON (*Ann. Rpt. Dept. Agr. New Zealand, 1904, pp. 284–291, pls. 2*).—An account is given of the present status of the canning and evaporating industry in New Zealand, with the results of analyses of a number of samples of sulphured pulp, showing the percentage of sulphur dioxid contained in them.

Investigations were made to ascertain the best method of disengaging the sulphur dioxid from the pulp when required for jam making and other purposes. It was found that when the sulphured pulp was brought to a boil in a wide-mouthed vessel and then kept constantly stirred for 20 to 25 minutes the sulphur was practically all evolved. Sugar was then added and boiling continued for 20 minutes longer.

The jam made by this method was of an excellent bright color and when cold very stiff and firm. Further experiments showed that when sugar was added to the pulp before boiling and the mixture of pulp and sugar boiled together the sulphur was very difficult to drive off and even after boiling under these conditions for an hour or more a considerable amount of sulphur was still present. The prolonged boiling with the sugar caused the color of the jam to deteriorate considerably. In preparing fruit, therefore, for shipment to England it is believed that a moderate excess of sulphur may be used, as this is easy to get rid of on boiling.

Report of the viticultural expert, M. BLUNNO (*Agr. Gaz. New South Wales, 15 (1904), No. 11, pp. 1042–1047*).—In the state vineyard at Howlong it was found that the majority of grafted vines gave a much heavier crop than those on their own roots.

The nitrate content of different parts of the grape, M. METELKA (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 10, pp. 725–730*).—A series of observations is reported which show that all of the green parts of the grape contain nitrates at all stages of growth. The stems and the skins of the berries contain considerably more nitrate than the juice, which in perfectly ripe berries is almost entirely free from nitrate. The must as usually prepared, namely, by pressing the berries with the stems, always contains nitrate, but this nitrate usually disappears during fermentation and is not found in the wine. There are, however, perfectly pure natural wines which contain appreciable amounts of nitrate.

History of government tea culture in Java, J. A. VAN DER CHIJS (*Geschiedenis van de Gouvernements Thee-Cultuur op Java. Batavia: Landsdrukkerij, 1903, pp. VIII+604*).—This is an exhaustive account of the work done in the different provinces of Java in tea culture since the government has been under the control of the Dutch. Cultural methods, varieties, and tea production are discussed and statistics given of the industry.

Expedition to the Gold Coast to study native methods of cacao and kola culture, GRUNER (*Tropenpflanzer, 8 (1904), Nos. 8, pp. 418–431; 9, pp. 492–508; 10, pp. 540–559, figs. 5*).—An account of methods observed in the culture and marketing of cacao, kola, and rubber plants by natives of the Gold Coast.

Walnuts as grown and handled in France, A. G. FREEMAN (*Pacific Fruit World, 18 (1904), No. 7, p. 3*).—An account of the culture of walnuts in the vicinity of Grenoble, France, with a comparison of the methods observed in California in the cultivation of this nut. The favorite variety grown in Grenoble is the Mayette. The nuts of this variety are well filled even under adverse circumstances, and the meat is always white.

Two other varieties of commercial importance are the Franquette and the Parisian. The average crop for this section is about 2,000 tons each season, of which one-half is of the Mayette variety.

A model walnut orchard (*California Cult., 23 (1904), No. 17, pp. 411, 426*).—The walnut orchard of J. B. Neff, in Orange County, California, is described and an account given of the method of handling the nuts on that farm. The nuts are gathered, hull and all, and run through a hulling machine, which is a much more rapid process than by the old method of hand hulling. After hulling, all stained nuts are dumped into a circular cage with streams of water forced into it, and washed. The formula used in bleaching the nuts is made of 16 lbs. of sal soda, 20 lbs. of chlorid of lime, 1 to 4 lbs. of sulphuric acid, and made up to 50 gal. with water.

In making the solution the sal soda is dissolved in hot water and poured into a hard-wood barrel having a wooden faucet about 5 in. above the bottom. The chlorid of lime is reduced to a paste in a tight box by use of a hoe and a small quantity of water. It is then added to the dissolved sal soda in the barrel and the barrel filled to 45 gal. with clear water. The whole is then thoroughly mixed and allowed to stand 48 hours before using, so that all sediment may be on the bottom and the liquid clear. When ready for use, 5 gal. of the water is poured into an earthen jar and the sulphuric acid slowly added, a few spoonfuls at a time.

The nuts are bleached in a spiral carrier revolving in a tank of this solution. It requires about 1½ minutes to traverse the length of the carrier, after which the nuts are ready for drying and packing.

A concise handbook of garden flowers, H. M. BATSON (*London: Methuen & Co., 1903, pp. VIII+256*).—Very brief descriptive and cultural directions are given for some 1,200 or 1,300 different species of plants arranged in alphabetical order.

Lilies for English gardens, GERTRUDE JEKYLL (*New York: Charles Scribner's Sons, 1901, pp. 72, pls. 61, figs. 5*).—This is an amateur's handbook, and is intended as a guide to those who wish to grow lilies in English gardens. It describes various species of lilies which may be successfully grown in English gardens, and gives directions for the culture of these flowers. Some notes are also given on the lily disease.

FORESTRY.

Effect of forests on water supply, T. P. LUKENS (*Forestry and Irrig., 10 (1904), No. 10, pp. 465–469, figs. 3*).—The effect of forests in the conservation of water supplies, as shown from observations in southern California, is described.

One of the most striking demonstrations of the loss of water through forest fires is reported in the San Gabriel Forest Reserve. Here in a drainage basin of 222 square miles the minimum flow was reduced to 90 miner's inches, while for the same period the San Antonio River drainage basin, with an area of only 26.7 square miles, furnished a minimum of 190 miner's inches of water. In the case of the San Gabriel River nearly all the drainage basin had been burned over, destroying even the smaller growth. In the other region more than one-half was well forested, containing a good growth of timber and chaparral, and to this is attributed the greater water flow.

A second illustration is given in the amount of water measured in a river. The portion of the river where the seepage beds on either side were well covered with willows, alders, and other trees, showed an increase of 38 miner's inches of water in 4 miles, while in the denuded region the measurements showed a shrinkage of over 20 miner's inches. Marked variations are reported between the morning and evening measurements where regions have been severely burned over, while in well-forested regions the difference was so slight as to be imperceptible.

In another example cited the drainage basin of a small stream had been burned over in 1885 and the water supply decreased immediately, failing entirely the season after the fire. Since that time chaparral and trees have become established and the water supply has reappeared and seems to be annually on the increase.

Control of the Kansas River floods (*Forestry and Irrig., 10 (1904), No. 10, pp. 460–463, figs. 3*).—Notes are given on the Kansas River floods, which in 1903 caused losses of over $20,000,000. For the prevention of such losses it is recommended that along the banks and the watersheds of the streams trees should be planted and forest conditions brought about as much as possible.

Forestry as applied to the development of Kansas, G. W. Tichner (*Forestry and Irrig., 10 (1904), No. 10, pp. 471–473*).—Attention is called to the denuded condition of Kansas and the necessity for the artificial production of forests. That this is possible is shown by the ready growth of a number of species of trees, and the increasing value due to the demand for timber of various kinds will more than compensate for the expense, provided the plantation is properly made and cared for. Notes are given on the location of the plantation and species of forest trees adapted to Kansas conditions.

Report on forestry work, A. W. Crooke (*Jour. Dept. Agr. Victoria, 2 (1904), No. 9, pp. 901–909*).—A report is made of the work of the forestry branch of the Victorian Government, in which it is stated that strong efforts have been made to improve the reserves and conserve the present stand of timber, while at the same time providing for present requirements. This has necessitated the imposition of strict regulations, and serious objections have been raised against them by persons immediately interested.

The author criticises the present system of alienation of forest lands and describes the royalty system, which is considered fairer, and under which the forest area of the State should, in the opinion of the author, be brought. The grazing condition in the forest lands is unsatisfactory and demands revision.

During the past year considerable work has been done in cutting railway timbers, and although seriously opposed at first it has in many instances proved advantageous, as the removal of culls and overmatured trees has not only benefited the forest but has produced a considerable revenue.

The plantations devoted to wattle growing have been extended and new ones are projected for the coming year. As far as the author's information goes, there is no forest tree that produces such large areas in so small a period of time on a given expenditure. While wattle cultivation has been profitable under the department management, similar results have not always been attained by private individuals.

The condition of the nurseries and plantations maintained by the State are described, and considerable improvement thinning has been carried on. Notes are given on the waste of timber, forest fires, general conditions, and revenue of the State forests.

The cultivation of the Australian wattle, D. G. Fairchild (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 4, pp. 7, pls. 3*).—An account is given of the cultivation of the Australian black wattle (*Acacia mollissima*), the bark of which has long been used for tanning purposes. The information given is largely drawn from observations of plantations made in Natal, in the hope of calling attention of tanners to this possible source of tanning material and possibly of stimulating the cultivation of the trees in portions of the United States suited to its growth.

Woods of the Philippines, E. C. SMITH (*Forestry and Irrig., 10 (1904), No. 10, pp. 479, 480*).—Notes are given descriptive of the character and value of a number of the more valuable species of woods exhibited in the Philippine forestry exhibit at the Louisiana Purchase Exposition at St. Louis. Among those described are narra, calantas, and molave. All of these belong to the first class of timber and are among the more valuable as well as higher priced timbers furnished by the islands.

Report on the condition of treated timbers laid in Texas, February, 1902, H. VON SCHRENK (*U. S. Dept. Agr., Bureau of Forestry Bul. 51, pp. 45, pls. 3*).—In a previous publication (E. S. R., 14, p. 154) an account was given of projected experiments on the preservation of railroad ties by treating them with different materials. In the present bulletin the results of an examination of these treated ties after having been used for nearly two years are given.

The timbers used in the experiments consisted of various varieties of oak, beech, tamarack, hemlock, and pine. The treated and untreated specimens were laid, all ties of the same timber being together. In this way approximately the same conditions were obtained for the same timbers. A general inspection of the condition of the ties was made in November, 1903, followed by a second inspection in June, 1904.

At this time practically all of the untreated timbers showed more or less decay. Hemlock, tamarack, loblolly pine, and beech showed the least resistance, followed closely by the longleaf pine, while the oaks all showed the greatest resistance. Ties which received zinc chlorid and Wellhouse treatments showed no signs of decay, which was also true of those treated with the Allardyce process, when applied in a proper manner. An examination of some of the oak ties showed that they had become excessively brittle on account of being too highly heated during the treatment.

Timbers which had received the spirittine treatment were generally found in good condition. Timbers treated with the Barschall or Hasselmann process were less satisfactory, but it is claimed by representatives of the Barschall Company that the treatment was not properly applied. The results of all the tests indicate that where timbers are to be compared they should be treated in large quantities and as nearly as possible under the general conditions governing the treatment of timber for commercial purposes.

A detailed report is given of the condition of the different ties, and appendixes show the nature of the treatment and method of application.

Progress report on the strength of structural timber, W. K. HATT (*U. S. Dept. Agr., Bureau of Forestry Circ. 32, pp. 28*).—A progress report is given, showing the partial results of the timber tests now being carried on by the Bureau of Forestry to determine the mechanical properties of the various commercial timbers of the United States. The data presented contain results of cross-bending tests on about 250 large beams of structural timber. A more formal publication in the form of a bulletin is promised, in which a detailed account of the methods and machines used as well as the results of the individual tests will be given.

In arranging these tests the Bureau of Forestry has for the present limited its testing to those species that promise to be on the market for an indefinite period, to those actually present in the market, and to such purely scientific work as forms the basis for correct methods of testing. The timber tests have been made in cooperation with the laboratories of the University of California, Purdue University, the Bureau of Chemistry of this Department, and the Yale Forest School. The species under investigation at the present time are the Pacific Coast red fir, also known as the Oregon pine or Douglas spruce, the western hemlock, red gum, longleaf pine, and loblolly pine. Later it is expected to test the redwood and the western yellow pine.

The general results of the tests of the different classes of timber are given, and particular attention is paid the tests of red gum. These have been undertaken on

account of the large stumpage of this timber and the present demand for information regarding it. In testing the red gum comparisons were made with hickory, which it is proposed to use as a substitute, but a careful examination of the mechanical properties of the red gum indicates that it is inferior in strength to the poorest grade of hickory. In an appendix the results of the different tests are given in tabular form.

SEEDS—WEEDS.

Seed selection according to specific gravity, V. A. CLARK (*New York State Sta. Bul. 256, pp. 367–425, pls. 2, dgms. 4*).—The investigation here reported is an outgrowth of work begun by the horticulturist of the station on seed selection as applied to the breeding of grapes, and the present account is presented as a tentative one subject to future verification.

Two methods were used in studying the specific gravity, one being designated as the method of separates and the other the method of samples. The method of separates is more or less arbitrary, and has been frequently employed to separate lots of seed into 2 or 3 lots of generally equal quantities. The separation by samples is through the use of the pycnometer method, in which the selection is made according to specific gravity. This method gives very exact results, but is slow of application and would not be suited to garden use.

The writer in his experiments used a series of salt solutions differing in their specific gravity by 0.01. It was found unnecessary to use solutions differing by less than this, as there was little or no difference in the cultural characters of seeds when separated by no more than 0.01 of their specific gravity. The experiments were carried on with seeds of grapes, mustard, timothy, clover, peas, peppers, turnips, cabbage, egg plant, etc., and the author discusses the range and distribution of seeds with respect to their specific gravity and the possibility of separating foreign matter from seeds by means of solutions, the relation between specific gravity of seeds and vigor of germination, the relation between specific gravity of seeds and their color and vitality, etc.

It was found that seeds of the same lot are commonly distributed through a considerable range of specific gravity, and that if the seeds are of good quality the larger part of them will fall within a relatively narrow range near but not at the upper limit of specific gravity for the variety. In the case of oil-bearing seeds the range for greatest frequency of distribution is somewhat lower. Specific gravity may in many instances be utilized as a means of separating foreign matter from samples of seed.

A definite correlation was found to exist between the specific gravity of seeds and their germination. Seeds of low specific gravity do not germinate at all. Those of slightly higher specific gravity germinate poorly and in many cases produce comparatively weak plants, while those of the highest specific gravity show the highest germination, except in the case of oil-bearing seeds, as already noted above. In some species there was found a correlation between the specific gravity of the seed and its color, and to some extent a similar correlation appears to exist between the specific gravity of the seed and the vigor of the resulting plant. Various factors as influencing differences in the specific gravity are discussed.

The author gives a bibliography of some of the more important works relating to the subject.

Seed testing and instructions for sampling, R. S. SETON (*Yorkshire Col., Leeds, and Yorkshire Council Agr. Education [Pamphlet] 33, 1903, pp. 4*).—A statement is given of the conditions under which seed testing is undertaken by the Yorkshire College, and directions for the methods of sampling and size of samples required, together with a schedule of charges made for reporting upon the different varieties of seeds.

Adulteration of alfalfa seed, J. WILSON (*U. S. Dept. Agr., Office of the Secretary Circ. 12, pp. 2*).—A brief report is given of investigations of alfalfa seed which were

made in carrying out the provisions of the act of Congress making appropriations for the Department for the current fiscal year, in which "the Secretary of Agriculture is directed to obtain in the open market samples of seeds of grass, clover, or alfalfa, test the same, and if any such seeds are found to be adulterated or misbranded . . . to publish the results of the tests, together with the names of the persons by whom the seeds were offered for sale."

An examination of all the alfalfa seed obtained in the open market showed 12 lots to be adulterated within the meaning of this act, the principal adulterants being bur clover and yellow trefoil, the total amount varying from 10.4 to 46.12 per cent.

Tests of grass and forage crop seeds collected in 1903 (*Maryland Agr. Col. Quart., 1904, No. 26, pp. 19*).—A report is given of the results of tests of samples of grass and forage crop seeds collected by the chemical department of the Maryland Agricultural College during 1903, the tests having been made under the supervision of E. Brown, botanist in charge of the seed laboratory of the Bureau of Plant Industry of this Department. The results, which are in tabular form, show the different kinds of seed, name and address of seller, results of the purity and germination tests. The price paid per hundred pounds for the different lots of seed is given and the actual cost, as shown by the results of the tests, is indicated.

Influence of carbon bisulphid on the germination of seeds, J. Bolle (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 183, 184*).—In the report of the Agricultural Chemical Station of Görz for 1903 an account is given of experiments made to determine the proper method of handling, duration, and amount of carbon bisulphid needed for treating seeds for the destruction of weevil, and also on the effect of the treatment on the germination of the seed.

Wheat, rye, barley, corn, and peas were treated at different temperatures, ranging from 2° to 10° C., and were exposed to the fumes for from 1 to 10 days. At the lower temperature the consumption of carbon bisulphid through evaporation fell to 0.5 to 1 gm. per liter of space, even when the experiment was prolonged for 10 days. The effect on the germination was not always the same. The germination of peas and doubtless other leguminous seed is lowered by 10 days' exposure to carbon bisulphid fumes.

The cereals were injured, but in different degrees. Barley showed the least injury, followed by wheat, rye, and corn. The oil content of the seed was found to exercise an important influence on the amount of injury done, and in all the experiments the length of exposure was an active factor in determining the amount of injury.

Report of the seed-control station of Vienna for 1903, T. von Weinzierl (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 209–264, pl. 1*).—During the season covered by this report there were 18,928 analyses of seed reported and 15,209 sacks of grasses and forage-plant seed certified to. A tabular report is given, showing the maximum, minimum, and average purity and germination of the more important seed, comparisons being made with the figures obtained in the previous year. Particular attention has been paid in the report to the adulteration of seed and the presence of dodder in clover seed.

Some brief notes are given of various plant diseases investigated during the year, and the relative value of grass-seed mixtures is commented upon. In the field experiments reported upon, notes are given on the demonstration fields for grasses and fodder plants, 135 such fields being in operation. The station is continuing its work in cereal breeding and briefly reports upon its experiments with pedigreed stock of different varieties of rye, wheat, barley, and oats. Culture experiments with a number of agricultural crops are reported in different parts of Austria, and an account is given of the Alpine stations maintained by the Austrian Government.

Report of the seed-control station of Troppau, 1902-3, Kamberský (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 4, pp. 361-364*).—A report is given on 1,671 examinations of seed of clovers, grasses, and other plants, which includes the exam-

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ination and certification of a large number of bags of clover seed. The maximum, minimum, and average germination of the important seeds are shown and brief comments given on some of the foreign seeds present.

Report of the seed-control station at Hohenheim, J. MICHALOWSKI (*Separate from Württemberg. Wchnbl. Landw., 1904, No. 3-4, pp. 5*).—The author reports on the purity and germinative ability of 1,224 samples of seed of clover, grasses, cereals, and other plants, the usual data regarding purity and germination being given in tabular form. Comments are given on the relative value of a number of seeds from different countries, and the occurrence of dodder in clover seed.

Dodder to some extent was found in 38 per cent of all the red clover examined, 30 per cent of the white clover, 17 per cent of the alsike clover, and 11 per cent of the alfalfa seed. A table is given showing the guaranty of the different samples tested for dealers.

Twenty-third report of the Warsaw Seed-Control Station for the year 1902-3, Z. A. ZELINSKI (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 4, pp. 501-505*).

Legal and customary weights per bushel of seeds, E. BROWN (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 5, pp. 10*).—The varying weights of field and garden seeds when measured leads to considerable confusion, and while the selling of seeds by the measured bushel is largely giving place to measurement by weight, it is thought desirable to report on the legal and customary weights per bushel of different kinds of grass, grain, and other seeds.

The weights per bushel of grain do not vary as much as do those of grass seeds; nevertheless the weight per bushel in any case is an important factor to be considered in grading. The weights given are those established by laws in different States, and these have been verified in each case by the secretary of state.

DISEASES OF PLANTS.

The vegetative life of the rust fungi of cereals, C. B. PLOWRIGHT (*Gard. Chron., 3. ser., 36* (*1904*), *No. 937, p. 403, fig. 1*).—A review is given of some of the recent publications of Eriksson relative to the vegetative life of the rust fungi. It is claimed that an examination of leaves affected by *Puccinia glumarum* showed the mycoplasm present in many sections. When present it was found to more or less fill the space of the cells and to contain granules, which were colored pale violet by Flemming's reagent. Sections examined from leaves of plants which were known to be noninfested or from varieties of cereals which are seldom attacked by the rust did not show any traces of this mycoplasm. This is regarded as intermediate between the ordinary protoplasm and the typical fungus protoplasm.

No mycelium is developed from such cases until the following summer, when uredospores are formed. Sections taken from infected leaves 4 to 6 mm. beyond the most external spore-bearing area, showed the mycelium to consist at first of masses of granular protoplasm between the cells of the plant, and from these masses outgrowths take place which force their way among the cells. At first the granules are very small, but they soon increase in size. These elongated masses become invested by a very delicate membrane which thickens and eventually acquires a double contour. Partition walls appear and some of the granules become surrounded by a clear area.

In a more recent paper[a] Eriksson confirms the above results with additional species, particularly with the crown rust of rye (*P. dispersa*) and the yellow rust of barley (*P. glumarum hordei*). In these he finds the extension of the plasmic masses not only between the cells of the host plant, but often from cell to cell through the normal openings in the cell walls. The author states that the existence of a parasitic fungus

[a] Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 1, pp. 85-87.

in a protoplasmic form in the tissues of the host, from which is developed mycelium and spores under certain conditions of environment, is an important one and one which may possibly solve some of the phenomena of the life history of other fungi.

Three-spored rusts, M. C. COOKE (*Gard. Chron., 3. ser., 36 (1904), No. 938, p. 418, fig. 1*).—In commenting upon a note given in Bureau of Plant Industry Bulletin 63 (E. S. R., 16, p. 274), in which three forms of spores are described for *Puccinia vexans*, the author calls attention to this peculiar species for the purpose of drawing an analogy with others, and mentions having observed similar phenomena in *Puccinia pruni*, in which this fungus produces uredospores, teleutospores, and amphispores.

Uredineous infection experiments in 1904, W. A. KELLERMAN (*Jour. Mycol., 11 (1905), No. 75, pp. 26–33*).—In continuation of previously recorded experiments (E. S. R., 15, p. 687), the author gives the results of his third season's work with various species of Uredineæ. The principal species investigated were the maize rust (*Puccinia sorghi*), sunflower rust (*P. helianthi*), and pine rust (*Peridermium pini*).

The maize rust was found capable of producing uredospores directly from teleutospores. The uredo stage of this rust was found to be indiscriminately transferred to the different biologic species of maize, seeming to indicate that there are no biologic forms of this rust. In addition to maize it was found to be successfully transferred to teosinte, but inoculations on sorghum, sugar cane, and *Tripsacum dactyloides* failed.

Inoculation experiments with a rust taken from the artichoke showed that this species is the same as the one frequenting the sunflower, *P. helianthi*. Teleutospores of *P. thompsonii* were grown on *Sambucus canadensis*, showing that this rust is identical with *P. sambuci*. Successful inoculations on *Campanula americana* were made with *Peridermium pini*, showing that this form is contained in the life cycle of *Coleosporium campanulæ*.

Oat and barley smut investigations, R. A. MOORE (*Wisconsin Sta. Rpt. 1904, pp. 317–320*).—In continuation of previous investigations on oat smut (E. S. R., 15, p. 1087; 16, p. 64), the author gives the results of his investigations to determine the amount of smut present in oat fields throughout Wisconsin. Personal examinations were made of 201 fields where the seed had not been treated for the prevention of smut and 10.5 per cent of the oats was found to be diseased, while in 79 fields where the seed had been treated only 0.4 per cent of smut was found.

A tabulation is given of data collected through the Wisconsin Agricultural Experiment Association showing that of 1,315 farmers reporting, 313 had treated their seed oats for the prevention of smut, and the crop from the treated seed showed 2.31 per cent smut, while the average per cent of smut in the fields where the seed had not been treated was 7.04. In a similar way 134 farmers reported on the occurrence of barley smut, 14 of whom had treated their seed barley. The average percentage of smut present in the fields sown with treated seed was 2.25 per cent, as compared with 6.08 per cent from untreated seed.

The author strongly urges the treatment of oats and barley with formaldehyde for the prevention of smut. He says that barley smut is on the increase in Wisconsin, and from personal investigations in 176 barley fields he found that an average of 4.5 per cent of the crop was lost due to the disease. As the barley crop of the State amounts to 13,500,000 bu., this loss, which to a great extent may be prevented, is quite serious.

Treating seed wheat to prevent smut, E. F. PERNOT (*Oregon Sta. Rpt. 1903, pp. 56, 57*).—A brief account is given of the effect of treating seed wheat with different strengths of solution of copper sulphate and formaldehyde and of heating the dry seed for half an hour at a temperature of 150° F. The treated seed was planted, and the total number of plants and the number of heads formed for each 100 seeds are shown.

Soaking seed in both copper sulphate and formaldehyde was injurious to germination, while the seed subjected to the hot-air treatment not only produced the greatest number of plants but also the highest number of heads of wheat. The effect of the treatment on the smut is not stated.

Earcockle in wheat, R. HELMS (*Jour. Dept. Agr. West. Australia, 10 (1904), No. 1, pp. 34–38, figs. 2*).—A description is given of a disease of wheat and other cereals which is caused by attacks of the nematode *Tylenchus tritici*. These nematodes by reaching the newly formed heads attack the reproductive organs, damaging and destroying them. As a consequence, no seed is formed, but instead galls are produced which serve as a shelter for the young nematodes.

The larvæ are said to retain their vitality for a long time, and a brief experiment shows that repeated drying and exposure to hot sunshine for 18 days did not affect their vitality. Other experiments seem to indicate that they may be revived after 5 or more years' suspension.

In combating this trouble, which is becoming serious in parts of Australia, rotation of crops is recommended, care being taken not to introduce other cereals or certain grasses, as they are subject to attack. Where wheat is sown, it is suggested that it should be treated with fungicides for the prevention of fungus attacks, and this treatment will cause the lighter-infested grains to float so that they may be readily skimmed from the fluid.

Potato diseases, H. H. HUME (*Florida Sta. Bul. 75, pp. 181–196, figs. 7*).—Descriptions are given of a number of diseases of potatoes which have been observed by the author as occurring more or less seriously in Florida. The disease which attracts most attention is the late blight (*Phytophthora infestans*), a description of which is given, and the effect, as shown by the yield in various regions, is indicated. This disease is believed to have been introduced recently into Florida in seed potatoes. As methods of control the author suggests the exercise of care in securing the seed potatoes, and thorough spraying with Bordeaux mixture, 5 or 6 applications to be given the plants.

Notes are also given on the early blight (*Alternaria solani*), potato scab (*Oospora scabies*), and the Rhizoctonia disease. This last disease is said to be widely distributed in Florida, and a careful examination made of seed potatoes offered for sale by different dealers failed to show a single lot which did not contain the sclerotia of the fungus on some of the tubers. Experiments in controlling this disease were carried out, in which the seed tubers were treated with corrosive sublimate, copper sulphate, formalin, phosphatic slag, and lime in various amounts.

The largest yields were obtained where the potatoes had been exposed to the light and air until they became quite green and then planted, while the plat receiving lime at the rate of 1 ton per acre and the seed treated with formalin was freest from disease. As this is a soil fungus, rotation of crops should be urged, and the probability of resistant varieties is mentioned.

Brief notes are given on the bacterial disease of potatoes and the relation between leaf-eating insects and this bacterial blight is pointed out.

Potato failures, F. M. ROLFS (*Colorado Sta. Bul. 91, pp. 33, pls. 5*).—This is a second report of the author's investigations on the so-called Rhizoctonia disease of potatoes. In a previous publication (E. S. R., 14, p. 159) the results of experiments and studies of the Rhizoctonia of the potato for 1901 were given. This disease is widely distributed throughout the United States and the fungus is of a truly parasitic nature. The different stages of the fungus are described, and from present information it is attributed to the fungus *Corticium vagum solani*. The fruiting stage of the fungus has been previously reported (E. S. R., 15, p. 686).

The effect of the organism on the plant or stalk, on the tubers, and the rotting of the seed is described, and it is found that high temperatures and plenty of moisture contribute very materially to the rate of growth. Heavy, poorly drained soils seem

to favor its development, and the sclerotia on the seed tubers are believed to be the principal means of disseminating the disease. When the field is once infested with the fungus other crops should be grown for at least 3 years, and care should be exercised in the preparation of the soil and the use of irrigation water.

Late planting frequently gives better results than early planting. The practice of scattering the old stems over the potato fields should be abandoned; all old potato stems should be gathered and burned after harvest. Care should be exercised in storing potatoes to keep them at a uniformly low temperature, and if spread in the light and air for several weeks before planting they will produce strong, hardy sprouts which are better able to resist the attacks of the fungus.

Notes are given on the possibility of developing disease-resistant varieties, seed selection, and treatment where potatoes are planted in uninfested soils. Treating with corrosive sublimate or formalin may be recommended, the corrosive sublimate being preferred. Where the seed tubers are soaked in these solutions and planted in infested soils decided losses have been observed. The use of sulphur and lime have been without any benefit. A detailed account of the experiments, together with their results, completes the bulletin.

Large potato vines and no potatoes, W. PADDOCK (*Colorado Sta. Bul. 92, pp. 8, pls. 2*).—This bulletin contains a condensed and popularized statement of the work on potato diseases at the Colorado Station, most of which has appeared in Bulletins 70 and 91 of the station (E. S. R., 14, p. 159; 16, p.).

Some diseases of cane considered in relation to the leaf-hopper pest and to the stripping of cane, R. C. L. PERKINS (*Hawaiian Sugar Planters' Sta. Rpt. 1904, pp. 63–66*).—A discussion is given of some of the diseases of sugar cane, particular attention being paid to the relationship between the stripping of cane and the leaf-hopper pest and the distribution of the diseases. The principal diseases are the different forms of *Trichosphæria sacchari*, of which the pineapple disease, root disease, and "cane spume" are described.

In order to prevent the occurrence and spread of these diseases, the author suggests that unless it is absolutely necessary for reasons of cultivation, no cane should be stripped so as to expose the joints while the rind is still soft. When stripping is followed the leaf hoppers are able to deposit their eggs more readily, and through these injuries the fungus may obtain entrance to the plants.

Observations on the Botrytis rot and drop of lettuce, H. J. RAMSEY (*Wisconsin Sta. Rpt. 1904, pp. 279–288, figs. 2*).—An account is given of experiments with head lettuce in the station greenhouses during the past winter. The experiments for the most part were unsuccessful owing to attacks of disease. The house was new and the soil fresh, and no trouble was anticipated, but after a period of vigorous growth the tips of the leaves were found to be burned although no trace of any organisms could be found. A few days after the appearance of the burning of the plants the color turned to a buff brown and the characteristic mycelium of *Botrytis cinerea* could be observed. The inner and more tender leaves of the head were the first to be attacked, after which the progress of the fungus was very rapid. Soon after the watery decay of the leaves began the characteristic gray mold appeared on the surface. This same fungus was found on decaying organic matter where it was living saprophytically, but in the above cases it was truly parasitic. Numerous experiments were made to inoculate healthy plants from the spores, but only when the plants were placed under bell jars and kept very moist were any infections secured.

A disease termed black rot was observed in a few cases, the infection usually taking place where the leaves were in contact with the soil, and the mycelium growing through the midrib and veins to the stem. Later the leaves fell from the stem, leaving dark spots where they had been attached, and on account of this character the disease has been termed the black rot.

According to the author, the tip burn, which was probably of a physiological nature, served to reduce the vitality of the plants, making them subject to the fungus attack. When first noticed the mycelium of the fungus was only to be found in the tips of the leaves which had tip burn characteristics.

Later in the winter a second greenhouse was planted with lettuce, and in this case the plants nearly reached maturity before they were attacked by any fungus and there were but few cases of the typical Botrytis present. The most injury in the second experiment was done by the typical drop, *Sclerotinia libertiana.* When attacked by this fungus the plants collapsed as though the stem had been cut off. The fungus develops rapidly, and its occurrence in the soil shows that it can live both as a saprophyte and a parasite.

The author believes that there are two distinct species of fungi causing the drop disease of lettuce, and expects to continue his observations on the disease during the coming season.

Apple scab, A. B. Cordley (*Oregon Sta. Rpt. 1904, pp. 38–40*).—An account is given of some experiments in spraying 400 Newtown Pippin trees with Bordeaux mixture for the control of apple scab. The orchard was sprayed five times with a 4-4-50 solution of Bordeaux mixture, the applications being made on April 30, May 14–19, June 1–3, July 1–3, and August 15.

The fruit when gathered was carefully inspected and separated into classes, and it is stated that the sprayed trees bore approximately 10 times as much fruit free from scab as the unsprayed trees, or, while the unsprayed trees produced fruit only 7 per cent of which was free from scab, the sprayed trees produced a crop 70 per cent of which was free from disease.

Discovery of a fruiting stage of the apple mildew in England, G. Massee (*Gard. Chron., 3. ser., 36 (1904), No. 934, p. 349, figs. 2*).—The apple mildew (*Sphærotheca mali*) has been well known in England for many years, but until the present season the ascigerous or fruiting form has not been reported. Specimens were submitted to the author in which the fruiting form was discovered on adventitious shoots springing from the base of the trunk of an old apple tree.

The use of sprays and dry sulphur powders seems to have little effect on this fungus, and it is recommended that all diseased tufts of leaves, together with a portion of the shoots, be cut off and burned.

Black spot canker, W. L. Lawrence (*Washington Sta. Bul. 66, pp. 35, pls. 13*).—The black spot canker is said to be one of the most important and destructive diseases in the State and has been under observation since the summer of 1902. The results of the investigations are given in detail.

The disease, which is known by a number of names, is attributed to the fungus *Glœosporium malicorticis.* So far it has not been reported from any other host than the cultivated apple tree, but as similar canker diseases are found on other species of trees, it is possible that some relation may yet be established between them. All varieties of apples seem to be susceptible to the attacks of the fungus, although some are more frequently attacked than others, and there is frequently a difference in the susceptibility of a variety in different localities, even when grown under nearly the same conditions.

The amount of injury done is difficult to estimate, since trees may be badly affected and still produce a partial crop of fruit. However, when the canker has become very numerous the tree is weakened and after a while destroyed. Trees whose bark has become well developed and has assumed a heavy corky layer are immune to the disease.

Contact inoculations showed that the fungus is able to penetrate the smooth uninjured epidermis of young branches and twigs, and other experiments showed that it also entered through the lenticels and through various mechanical injuries done to the trees.

The disease, which resembles the bitter rot in attacking both the tree and the fruit, differs from it, however, in that the canker stage is by far the most injurious. A general description is given of the disease and particular attention given its occurrence on the fruit, producing what is called the black spot apple rot. Numerous inoculation experiments have shown that the fungus producing the canker also produces this rot of the fruit. In some instances the canker seems to be closely associated with the injury done by the bronze apple-tree weevil (*Magdalis ænescens*) and the woolly aphis (*Schizoneura lanigera*).

Various means for combating the disease were investigated, and it was found that on small young trees the disease could be kept in check by cutting out the cankers, which appear most abundantly from November to February. Mixtures of oils and fungicides have been tested, but further trial will be necessary before they can be recommended. For protecting trees against the disease spraying with a rather strong Bordeaux mixture in the autumn is suggested.

ENTOMOLOGY.

Insect pests (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 8, pp. 498–501, fig. 1*).—The asparagus fly (*Platyparea pœciloptera*) is described in its various stages, and notes are given on its injurious attacks. Where the infested area is small the flies may be caught by the use of sticky substances in the spring. They may also be collected early in the morning when resting on the asparagus shoots. Powdered charcoal may also be dusted on the tops of the shoots while the dew is on. In the summer and fall all infested stems should be dug up and burned.

Notes are also given on the tulip mite and black currant gall mite. In treating the tulip mite considerable success was had from fumigation with sulphur and by spraying with kerosene. Fumigation with carbon bisulphid is also recommended It is stated that the blue tit (*Parus cæruleus*) is injurious to apples and pears, in which it pecks holes near the base of the fruit. In the protection of the fruit against this bird the use of small shields of cardboard is recommended.

Injurious insects (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 9, pp. 557–562, figs. 2*).—*Lecanium persicæ* attacks plum trees and currants. This scale insect may be controlled by the use of a caustic alkali wash. The common cockchafer (*Melolontha vulgaris*) is a very destructive insect in forests. The beetle is described in its various stages and notes are given on its life history. In controlling this pest the grubs may be collected while cultivating the soil of tree plantations. The beetles may be captured when they first appear in the spring, and the insect may be controlled to some extent by the use of trap plants. Little success has been had from experiments in the use of insecticides under ground in destroying this insect.

Injurious insects and other animals observed in Ireland during the year 1903, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc.*, *1* (*1904*), *V, No. 12, pp. 249–266, pls. 2, figs. 7*).—Biological, descriptive, and economic notes are given on a number of insects injurious to cereals, grasses, beans, peas, potatoes, onions, and other garden vegetables as well as to fruits. Particular attention is given to grain flies, spring tails, carrot flies, *Rhizoglyphus echinopus*, black currant-mites, etc.

Injurious and beneficial slugs and snails, F. V. Theobald (*Jour. Bd. Agr.* [*London*], *11* (*1905*), *No. 10, pp. 594–602, figs. 2*).—During the past 4 years there has been an apparent increase in the number of slugs throughout Great Britain, and wheat, cabbage, potatoes, peas, beans, and other crops have been badly injured. Descriptive notes are given on a number of the most destructive species of slugs in Great Britain. These include *Limax agrestis*, *L. maximus*, *L. flavus*, *Milax sowerbii*, *Arion ater*, *A. hortensis*, and *Testacella haliotidea*.

Entomological department, R. A. Cooley (*Montana Sta. Rpt. 1903, pp. 38–52*).—An account is given of some of the more important injurious plant lice in Montana.

The species discussed include elm gall-louse, box-elder plant-louse, woolly aphis, currant aphis, apple aphis, cabbage aphis, and wheat plant louse. Brief notes are also given on the methods of combating these species and on their distribution in Montana.

Sixth annual report of the nursery inspector for the State of Wisconsin, C. BUES and E. P. SANDSTEN (*Wisconsin Sta. Rpt. 1904, pp. 271-278*).—During the year under report 29 nurseries were inspected. The San José scale was not found in any of these nurseries or elsewhere in the State. Notes are given on the injurious attacks of strawberry-root louse, white grubs, strawberry-leaf roller, rose chafer, leaf hoppers on apples, pear slug, maple scale, onion maggot, crown gall, asparagus rust, etc.

Practical results from combating agricultural pests, A. L. HERRERA (*Com. Par. Agr. [Mexico], Circ. 11, pp. 49, pls. 3*).—Brief notes are given on the results which have thus far been obtained in the use of insecticides and fungicides in controlling injurious insects and fungus diseases of coffee and other economic plants in Mexico, as well as in the destruction of rats and other injurious animals and the protection of beneficial birds.

Insecticide experiments for 1904, J. B. SMITH (*New Jersey Stas. Bul. 178, pp. 8*).—During the season, experiments were made with a great variety of insecticides in destroying San José scale. The Universal insecticide and scale killer, Salimene and "Con. Sol.," appear to have no value for this purpose. Horticultural Compound was also of little use, but may be effective against plant lice. The same may be said of Pyrol Tree and Plant Spray, and of Rose-leaf tobacco extract. Crude petroleum was used with excellent success and is recommended as the best insecticide for application on pear trees.

Kill-O-Scale appeared to be effective but the market price is so high as to be prohibitive. Caustic soda proved to be absolutely ineffective. Lime and sulphur mixtures were used with more or less effect. Lime, sulphur, and caustic soda was applied with unsatisfactory results and the same may be said for sulphite of soda. Potassium sulphid was found to be quite effective. Lime, sulphur, and salt, prepared by boiling, was quite successful on peach and plum. Whale-oil soap was used in small quantities but gave good results. Brief notes are also given on a kerosene and limoid mixture.

Report on scientific work in the field of entomology during 1900, R. LUCAS (*Arch. Naturgesch., 67 (1904), II, No. 2, 2. half, pp. 289-944*).—An extensive bibliography is presented of literature relating to hymenoptera and lepidoptera published during the year 1900.

The metamorphosis of insect larvæ, J. DEWITZ (*Zool. Anz., 28 (1904), No. 5, pp. 166-182*).—It was found possible to check the development of the larvæ of *Lucilia cæsar* by maintaining them in glass tubes without a sufficient quantity of oxygen. It was also found possible to check the development of insect larvæ considerably by subjecting them to the action of hydrocyanic-acid gas.

In these experiments the larvæ of gypsy moth, brown-tail moth, and *Tortrix pilleriana* were used. Apparently the development of the wings of insects is brought about by the action of certain enzyms which are found in these embryonic structures. It is possible, therefore, to prevent the development of the wings by bringing unfavorable influences to bear upon the enzym. This condition may best be secured by the use of alcohol or dilute acids. It is thus easy to hinder the development of the wings in the pupæ of certain flies by treatment with dilute acetic acid.

The development of the intestines in insects during metamorphosis, P. DEEGENER (*Zool. Jahrb., Abt. Anat. u. Ontog. Thiere, 20 (1904), No. 4, pp. 499-676, pls. 12*).—The investigations reported in this paper were confined chiefly to a beetle *Cybister ræseli*. An elaborate microscopical study was made of the development of the various parts of the alimentary tract in this insect during the course of its meta-

morphosis. The literature relating to the development of the intestines in insects is critically reviewed in connection with a short bibliography.

The development of eye spots in the larvæ of Deilephila nerii and Pergesa porcellus, N. Y. CUZNETZOV (*Russ. Ent. Obozr, 4 (1904), No. 4, pp. 154–162, figs. 6*).—The author's study on the development of eye spots in these 2 closely related species of sphinx moths convinced him that there is no homology between these spots in different species. Detailed notes are given on the course and development of eye spots.

Common corn insects, J. M. STEDMAN (*Missouri State Bd. Agr. Mo. Bul., 3 (1904), No. 11, pp. 11–17*).—The chinch bug is said to cause considerable damage annually to corn in Missouri. Notes are given on the habits, life history, and injurious effects of this insect. In order to prevent the occurrence of this pest in too large numbers it is recommended that all rubbish, dead grass, and weeds be raked up into windrows in winter and allowed to remain for some time, after which they may be burned. Nearly all the hibernating chinch bugs will thus be killed. Economic and biological notes are also given on corn root-aphis, cutworms, wireworms, and bollworms.

The more important insect injuries of Indian corn, S. A. FORBES (*Illinois Sta. Bul. 95, pp. 329–399, pls. 5, figs. 38*).—This bulletin is in the nature of a monograph of the insect pests of corn, and is well illustrated with colored plates and otherwise. While corn is attacked by a large number of the species of injurious insects, particular attention is given in the bulletin to the most important pests.

In the general discussion in the first part of the bulletin an account is presented of the relation between the corn plant and its insect visitors, the effects of insect injury, general measures of prevention and remedies, insect injuries to different parts of the corn plant, injuries due to different orders of insects, and a grouping of corn insects according to their economic importance. The greater portion of the bulletin is devoted to the appearance, habits, life history, and means of combating various species of cutworms, webworms, stalk borers, army worms, corn-bill bugs, chinch bugs, grasshoppers, corn worms, etc.

Some insect enemies of corn, H. B. DERR (*Illinois Agr., 8 (1903), No. 4. pp. 64–66*).—Attention is called to the great number of species of insects which attack corn in a growing or stored condition. Among these pests especial mention is made of Angoumois grain moth, granary weevil, etc. As a remedy for these pests carbon bisulphid is recommended.

The cotton-boll weevil, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 14, pp. 11, figs. 5*).—The introduction, appearance, life history, and habits of this insect are briefly discussed in connection with their bearing upon the distribution and economic importance of the pest. The remedies recommended by the Division of Entomology of this Department are believed to be the most effective in controlling the weevil.

The cotton-boll weevil in Texas, E. D. SANDERSON (*Texas Sta. Circ. 8, pp. 157–170, figs. 6*).—This was a paper read before a joint meeting of the Association of Economic Entomologists and the Society for the Promotion of Agricultural Science at the St. Louis meeting, and has been previously noted (E. S. R., 15, p. 545).

Cutworms, E. D. SANDERSON (*Texas Sta. Circ. 5, pp. 2, fig. 1*).—In combating these insects it is recommended that poisoned bran mash be distributed in the infested fields.

The hop aphis (Phorodon humuli), W. T. CLARKE (*California Sta. Bul. 160, pp. 13, figs. 7*).—The hop aphis appears first in the spring upon staminate hop vines, where they reproduce rapidly for some time before migrating to the female plants. They confine their attacks to the leaves until the young hop cones are formed, when they also attack these. The hop cones are thereby reduced in size and the aroma is unfavorably influenced.

It was found by experimenting that the hop aphis could be successfully combated

by the use of a mixture of kerosene emulsion and tobacco decoction or by whale-oil soap and quassia. In these experiments kerosene emulsion was made by dissolving 7½ lbs. of ordinary soap in 15 gal. of hot water, to which 5 gal. of kerosene were added. The spray material was made by adding 3½ gal. of this emulsion to 40 gal. of tobacco decoction. This remedy cost about $6 per acre for 3 applications, while the mixture of whale-oil soap and quassia cost between $4.50 and $5 per acre for the season's work. The application of either of these washes so completely controls the hop aphis that the necessity of winter spraying is removed.

History of the occurrence of the sugar-cane leaf-hopper in Hawaii, R. C. L. PERKINS (*Hawaiian Sugar Planters' Sta. Rpt. 1904, pp. 43-61*).—This is a revised edition of Bulletin 1 of the Hawaiian Board of Commissioners of Agriculture and Forestry already noted (E. S. R., 15, pp. 488, 489). The pest is an Australian species and not identical with any other reported from other countries.

Grasshoppers, E. D. SANDERSON (*Texas Sta. Circ. 7, pp. 4, figs. 3*).—Brief notes on the habits of these pests, with suggestions regarding their destruction. The methods recommended include burning, the use of poisoned baits, ditching, post-hole traps, hopperdozers, etc.

The control of locusts in alfalfa fields, E. A. POPENOE (*Industrialist, 31 (1905), No. 15, pp. 231-234*).—The most injurious locusts in Kansas are *Melanoplus differentialis*, *M. bivittatus*, and *M. lakinus*. The author recommends the use of hopperdozers in controlling locusts and also the extensive raising of poultry in the vicinity of alfalfa or other field crops where locusts abound.

The asparagus fly (*Bd. Agr. and Fisheries [London], Leaflet 124, pp. 2, fig. 1*).—This insect is described and notes are given on its life history. In combating the pest in small areas good results have been had from sticking small rods in the ground, with some adhesive substance upon the ends of the rods. The flies may be collected in the early morning, and injured stems should be cut out and destroyed.

The cabbage-root fly (*Bd. Agr. and Fisheries [London], Leaflet 122, pp. 4, figs. 6*).—Descriptive notes are given on *Phorbia brassicæ*, and an account is given of its injurious attacks and life history. Early sown plants largely escape the attacks of this pest. Tarred paper or cards are preventive measures which have yielded considerable success. In small gardens the larvæ may be removed by hand. Rotation of crops is desirable in badly infested fields.

The apple maggot, F. W. CARD and A. E. STENE (*Rhode Island Sta. Rpt. 1904, pp. 191-201, pls. 3*).—The apple maggot is one of the worst apple pests of Rhode Island and can not be controlled by spraying, since the egg is deposited beneath the skin of growing fruit. Experiments have been carried on at the station for 5 years for the purpose of finding effective methods of controlling this pest. Notes are given on the habits and life history of the insect. The maggots enter the ground to a depth of about 1 in. for hibernation and remain in this position until July or later, when they emerge as adult flies.

Numerous experiments were tried in testing the value of covering the hibernating larvæ by plowing or spading under to as great a depth as possible. In some of these experiments considerable benefit seemed to be derived from this operation, while the results of other experiments were unfavorable. Experiments were repeated under different conditions in different seasons and in general appeared to indicate that a small percentage of the larvæ could be destroyed by burying in the soil or by treating the soil with crude petroleum or other similar insecticides. The authors conclude, however, from their experience of 5 years with this pest that the only effective remedy for controlling it consists in the destruction of windfalls by hand picking or by pasturing the orchard.

Plowing the orchard in the spring appears to be without permanently good results under the soil conditions which prevail in Rhode Island. There is some basis for the belief that frequent tillage in early summer may be unfavorable to the develop-

ment of the adult flies from the pupæ. Pasturing of orchards is recommended as the best remedy on a commercial scale, while thorough tillage is suggested as the next best method.

The pear-tree psylla and how to deal with it, G. E. FISHER (*Canad. Ent., 37 (1905), No. 1, pp. 1, 2, figs. 2*).—This insect passes the winter in an adult stage and is most successfully combated by the thorough application of lime and sulphur wash in March. At this season there are no eggs and the hybernated adults are sluggish. If a summer treatment is necessary, crude petroleum and water in the proportion of 1:16 is perhaps the most satisfactory remedy.

The San José scale (*Ontario Agr. Col. Rev., 17 (1904), No. 3, pp. 157–159, fig. 1*).—The distribution and injurious effects of this insect are briefly noted. In combating the pest some form of lime-sulphur wash is recommended. On account of the inconvenience involved in boiling this material experiments were made with the self-boiling form of the insecticide containing sal soda. The results were quite satisfactory.

Fumigation for scale insects, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 25 (1904), No. 4, pp. 432–435, fig. 1*).—Hydrocyanic-acid gas is considered to be the most efficient and on a large scale the cheapest remedy for scale insects of citrus trees. It had been hoped that the natural enemies of the red scale would keep this pest in check in Cape Colony. There seems, however, to be no prospects of such an outcome in the immediate future. Notes are given on the formula which should be employed and the methods used in generating hydrocyanic-acid gas for fumigating trees.

The lime-sulphur-salt wash, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 13, pp. 13, figs. 7*).—During the past winter the regular fire-boiled lime-sulphur-salt wash was used on about 75,000 trees in North Carolina with excellent results. Not only was the San José scale controlled but other scale insects, plant lice, and hibernating larvæ of codling moth were destroyed. The wash also had the beneficial effect of controlling fungus diseases. A number of formulas and methods are suggested for preparing lime-sulphur washes.

The author states that fruit growers may make a choice of the fire or steam-boiled lime-sulphur-salt wash, the same preparation without salt, and the self-boiled lime-sulphur-caustic-soda wash. The first preparation, however, is to be preferred and should be applied as a spray after being carefully strained. The best time to spray is just before the buds begin to swell.

A dangerous pest spreading (*Hawaiian Forester and Agr., 1 (1904), No. 12, pp. 328, 329*).—The lantana mealy-bug (*Orthezia insignis*) is said to be increasing in numbers and attacks tea, coffee, species of citrus, tomato, red pepper, and various forest and ornamental trees in addition to lantana. The insect has, therefore, become a pest of considerable importance and its injuries far exceed the benefits derived from the destruction of lantana.

Two plum weevils, E. D. SANDERSON (*Texas Sta. Circ. 6, pp. 4, figs. 4*).—Brief notes on the appearance, habits, and means of combating the plum curculio and plum gouger.

The biology of Chrysomphalus dictyospermi minor and the distribution of this scale insect along the Mediterranean Sea, P. MARCHAL (*Bul. Soc. Ent. France, 1904, No. 16, pp. 246–249*).—This pest is especially injurious to oranges and other citrus fruits but also attacks the myrtle, English ivy, box, magnolias, and various species of palms. Notes are given on the habits and life history of the insect. It is somewhat difficult to combat on account of the great variety of its food plants, the number of annual generations, and the irregularity in the time of emergence of the larvæ. For destroying the pest the author recommends spraying with various soap and oil emulsions.

The capture of Lepidoptera by means of acetylene lamps, J. Dewitz (*Allg. Ztschr. Ent., 9 (1904), No. 19–20, pp. 382–386*).—The author carried out a number of experiments in testing the effectiveness of acetylene lamps of different types in the capture of insects at night, especially Lepidoptera.

According to the experience of certain authors in the use of these lamps, the female moths which were captured had in the majority of cases already deposited their eggs. The value of acetylene lamps was, therefore, seriously called in question. In the author's experience, however, nearly all of the female moths captured still contained all of their eggs. This was true in all except 10 of 858 moths examined. Brief notes are given on different species of moths captured. Very few specimens of the brown tail moth were found in the lamps.

The shoot and fruit moth of red and black currants (*Bd. Agr. and Fisheries [London], Leaflet 123, pp. 3, figs. 2*).—*Incurvaria capitella* is described with notes on its habits and injurious attacks. Hand picking and burning of infested shoots is recommended, together with spraying by means of kerosene emulsion in fall or winter.

Notes on Papilio asterias with particular reference to its earlier stages and their difference from those of P. machaon, C. Floersheim (*Ent. Rec. and Jour. Variation, 16 (1904), No. 12, pp. 315–317*).—Notes are given on the points of resemblance observed between these 2 species of butterflies under different conditions.

Notes on Prionapteryx nebulifera, E. Daecke (*Ent. News, 16 (1905), No. 1, pp. 12–14, pl. 1, fig. 1*).—The author describes an apparent case of symbiosis between this moth and black ants belonging to the species *Prenolepis parvula*. The moth and ants apparently live together in tubes constructed along the stems and in the ground underneath huckleberry bushes. Such bushes were greatly stunted in their growth.

The fowl tick and hunter ant (*Trinidad Bot. Dept., Bul. Misc. Inform., 1904, No. 43, pp. 93, 94*).—The injuries from fowl tick are said to be somewhat less than during previous years and this fact is ascribed to the assistance of the hunter ant. This species is described as a large black ant which prevails in large numbers. While on such hunting expeditions they destroy many forms of insect life. The ants cause considerable nuisance about houses and stables which have to be vacated when the ants appear in large numbers. Horses appear to have a fear of them and attempt to break loose.

An ant killer (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 8, pp. 306, 307*).—For the destruction of ants the use of a mixture containing resin, sal soda, and tobacco tea is recommended.

Two leaf-miners, F. V. Theobald (*Gard. Chron., 3. ser., 36 (1904), No. 929, pp. 265, 266, figs. 3*).—The lilac leaf-miner (*Gracilaria syringella*) is described and notes are given on its habits and life history. In combating this pest in gardens and nurseries, it is desirable to pick off and burn all infested leaves. The laburnum leaf-miner (*Cemiostoma laburnella*) is discussed in a similar manner, with notes on its injurious habits.

In controlling this insect the author recommends the removal and destruction of all rubbish underneath the trees and the treatment of the trunks with a caustic-alkaline wash.

The larch leaf-miner, F. V. Theobald (*Gard. Chron., 3. ser., 36 (1904), No. 924, pp. 181, 182, figs. 2*).—*Coleophora laricella* is described and an account is presented of its injurious attacks upon the larch tree. The remedial measures recommended against this pest consist in the removal and destruction of infested trees from young plantations or the collection and destruction of the winter cases in small gardens and nurseries.

The composition of commercial soaps in relation to spraying, L. L. Van Slyke and F. A. Urner (*New York State Sta. Bul. 257, pp. 427–438*).—The investigation reported in this bulletin was undertaken for the purpose of determining the

causes of unsatisfactory results obtained in spraying with whale-oil soap. Sometimes the insect pests were destroyed and sometimes not. In some cases the foliage was uninjured, while in others the foliage was killed and the trees also. A brief account is given of the methods of making commercial soaps, the composition of soaps in general, and definitions of various component elements of soap. Analyses were made of 9 samples of commercial whale-oil soap. In these samples the water content was found to vary from 11.15 to 54.85 per cent, the real soap from 14.9 to 59.27 per cent, and the free fatty acids from 0 to 17.2 per cent. There was usually no free alkali. It was found that few manufacturers of commercial whale-oil soaps are willing to guarantee the composition of the soap. Horticulturists can not be certain of the commercial soap. On this account, experiments were undertaken in the manufacture of fish-oil soap at home. For this purpose the following formula is suggested: Caustic soda, 6 lbs.; fish oil, 22 lbs., and water, 1½ gal. This quantity will make 40 lbs. of soap. Experiments in the use of homemade soap showed that when used at the rate of 1 lb. in 7 gal. of water, entirely satisfactory results were obtained in destroying plant lice without injury to the foliage of apple, pear, plum, currant, cherry, and peach trees. Soaps were made so as to contain quantities of free alkali varying from 1 to 50 per cent. It was found that injury was done to the foliage when the amount of free alkali reached 10 per cent. With the usual market prices for the materials employed in the manufacture of fish-oil soap, it was found possible to make such soap for about 2¾ cts. per lb. Homemade fish-oil soap, therefore, possesses the advantages of greater uniformity of composition, greater reliability, and less cost.

Homemade soap for spraying, F. H. Hall, L. L. Van Slyke, and F. A. Urner (*New York State Sta. Bul. 257, popular ed., pp. 6, fig. 1*).—A popular edition of Bulletin 257 of this station noted above.

Carbon bisulphid, its nature and uses, C. Fuller (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 9, pp. 839–845*).—The chemical properties of carbon bisulphid are described in considerable detail. This remedy has been successfully used in the destruction of granary insects, white ants, red ants, tobacco weevils, phylloxera, mole crickets, insects in furs, carpets, etc., moles, rabbits, rats, and land crabs in dams. Directions are given for the application of the remedy under different circumstances.

Effect of free arsenious oxid on foliage, A. B. Cordley (*Oregon Sta. Rpt. 1904, pp. 40–47*).—A number of samples of Paris green were furnished by the Bureau of Chemistry of this Department and were tested in spraying experiments in Oregon. The results obtained have already been noted from another source (E. S. R., 16, pp. 76, 77).

In general, the results were very favorable and indicated that it is safe to spray apple, pear, and prune trees with ordinary samples of Paris green. The poison was applied, however, in a fresh condition very soon after being prepared for use. Brief notes are also given on the distribution of San José scale and crown gall in Oregon.

Thelohania legeri and a new species of parasite in the larvæ of Anopheles maculipennis, E. Hesse (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 36, pp. 570–572, figs. 10*).—The parasite described as a new species in this article is a microsporidial organism of which the life history is not yet thoroughly known. Several stages of the parasite, however, are described by the author.

Beneficial ladybugs, F. W. Terry (*Hawaiian Forester and Agr., 1 (1904), No. 11, pp. 299–302*).—Descriptive notes are given on 8 species of ladybugs which have been found more or less beneficial in the Hawaiian Islands. These species are described in their different stages and their beneficial effects are briefly indicated.

Sericulture in Madagascar in 1903 (*Agr. Prat. Pays Chauds, 5 (1905), No. 22, pp. 11–21, fig. 1*).—A general account is given of the extent of sericulture in Madagascar, together with especial notes on the organization and work of the government sericultural service, the distribution of mulberry trees, etc.

Power spraying, J. C. Blair (*Illinois Sta. Circ. 80, folio*).—An announcement of a field demonstration of power sprayers, held in a commercial orchard.

The world's silk production, J. C. Covert (*U. S. Dept. Com. and Labor, Mo. Consular Rpts. 75 (1904), No. 291, pp. 80–88*).—Statistical information is given regarding the extent of silk production and the condition of the industry in France, Italy, Spain, Austria, Levant, Syria, Turkey, Balkan States, Greece, China, Japan, and other countries.

FOODS—NUTRITION.

Fourth report on food products for 1903, B. W. Kilgore (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 1, pp. 69*).—The provisions of the State pure-food law are summarized and the work which has been carried out in 1903 under its provisions reported and discussed.

Besides a general summary, the bulletin contains the following special articles: Vinegar, by W. M. Allen; Tomato Catsup and Sauces, by W. M. Allen; Sugar, Molasses, Maple Sirup, and Honey, by J. M. Pickel; Flour, by C. D. Harris and F. C. Lamb; Corn Meal, by C. D. Harris and F. C. Lamb; Jellies, Jams, Marmalades, Apple Butter, and Preserves, by J. M. Pickel and F. C. Lamb; Breakfast Foods, by F. C. Lamb; Phosphates, Malts, Wines, Beers, Whiskies, Ciders, and Tonics, by W. M. Allen; Nonalcoholic Drinks, by F. C. Lamb; Coffee, by C. D. Harris, and Teas, by C. D. Harris.

In the case of vinegars 18 of the 62 samples examined were not true to name. All the catsups and similar sauces were found to contain coal-tar colors and added preservatives. No adulteration was found in the case of the sugars, flour, corn meal, breakfast foods, and tapioca examined. Three of the 11 samples of molasses contained glucose. The 4 samples of maple sirup, it was believed, might all be genuine.

Of the 68 samples of jams, jellies, etc., examined 54 per cent contained coal-tar dyes, 47 per cent benzoic acid, and 7.4 per cent salicylic acid. Forty-one of the samples did not claim or admit the presence of glucose, yet it was found in 33 of them. Twenty-seven of the samples were sold as compound jellies or preserves, glucose being the main sweetening agent. Sixteen of the 38 samples of coffee examined contained more or less coffee stems, bits of wood, small pebbles, etc. Two of the 21 samples of tea were faced with Prussian blue, and 7 samples fell below the standard as regards the hot-water extract or the soluble ash content, "indicating weak or possibly artificially exhausted leaves, but the deficiency was only slight."

In the article referred to above on breakfast foods proximate analyses of a number of sorts are given. It is pointed out that "oatmeals have been used for a long time, but it is only recently that preparations made from rice, wheat, corn, etc., have come into general use. The breakfast foods derived from oats have a greater food value than those foods derived from other cereals. These are all good, but they are not complete foods, as claimed by some of the manufacturers. In some cases the prices are very high."

Foods and food control. II, Legislation during the year ended July 1, 1904, W. D. Bigelow (*U. S. Dept. Agr., Bureau of Chemistry Bul. 83, pt. 2, pp. 23*).—The legislation enacted during the year ended July 1, 1904, in the several States and insular possessions of the United States and the District of Columbia with regard to food has been compiled.

A comparison of green and yellow rye with especial reference to the relation between color, gluten content, and baking quality, J. Wien (*Fühling's Landw. Ztg., 53 (1904), Nos. 12, pp. 433–440; 13, pp. 478–491; 14, pp. 518–527; 15, pp. 558–567; 16, pp. 595–604; 17, pp. 641–648, fig. 1*).—The results of an extended series of experiments are reported on the quality and comparative value of green and yellow rye. Among the conclusions reached were the following:

The color of the 2 sorts of grain is constant and transmitted in cultivation. The

green-seeded rye under like circumstances gives a larger yield, especially as regards size of kernels, than the yellow-seeded sort, and the seeds contain a larger amount of protein. Flour from both sorts was unusually satisfactory for baking purposes, though that from the green-seeded sort was regarded as superior on account of the lighter color and finer taste of the goods made from it. The baking quality is, of course, dependent upon the gluten and gliadin content.

Rye gluten contains both gliadin and gluten casein. The former is regarded as identical with that found in wheat, while the latter is in many respects like wheat glutenin, but the author believes it may be considered a different body or perhaps a special modification. Rye gluten is much darker in color than wheat gluten, and probably the gluten exercises a marked effect upon the color of the bread crumb, as it is noted that a high gluten content, especially the presence of an abundance of gluten casein, is accompanied by dark color.

The amount of gliadin in the rye flour exercises a decided effect upon the volume of the bread made. If it exceeds certain limits the dough becomes soft and the bread falls. Flour from yellow-seeded rye quite generally showed this property. Different methods of estimating the gluten and gliadin constituents of rye flour are spoken of.

Studies on the Alsop process of bleaching flour, C. Brahm (*Studien über das Alsop'sche Mehlbleich-Verfahren. Berlin: Versuchs-Anstalt des Verbandes Deutscher Müller [1904], pp. 18*).—The results of a critical study of the Alsop method of bleaching flour and of the effect of ozone on the color and baking quality of flour are reported.

The Alsop method depends, according to the author, upon the formation of nitrogen dioxid and allowing it to act upon the flour. The odor and baking quality of flour were unfavorably affected and its acid content increased. The color, in the author's opinion, was not improved, nor was the composition altered. The use of ozone for bleaching flour, he believes, can not be recommended, for although the color is improved the ozone imparts an odor to the flour which renders it unfit for use. Furthermore, the ozone affects the protein in such a way that the baking quality of the flour is much injured.

Local meals for storing (*Jour. Jamaica Agr. Soc., 8 (1904), No. 11, pp. 458–460*).—The desirability of storing on the island a considerable quantity of food products for use in time of emergency is discussed with special reference to the value of local food products for the purpose.

Analyses are given of Farine (cassava flour) and banana flour, by H. H. Cousins, and of sweet potato meal, by J. P. d'Albuquerque. The sweet potato meal had the following percentage composition: Water 5.75, protein 3.29, fat 0.62, nitrogen-free extract 85.79, crude fiber 2.87, and ash 1.68 per cent.

The composition and price of different sorts of meat and sausage, T. Kita (*Arch. Hyg., 51 (1904), No. 2, pp. 129–164*).—The author studied a large number of samples of meat and sausage with special reference to the amount of edible material supplied, and its composition as compared with the cost per pound, the samples being collected in Leipzig.

Under the experimental conditions he regarded mutton as the cheapest meat, veal as the dearest in relation to the nutrients furnished, and pork as the most satisfactory, especially for those performing muscular work, since for a given price it supplied the largest amount of protien with a generous quantity of fat in a palatable and easily digestible form. Sausages of various sorts are also regarded as economical.

The biology of decay of meat, G. Salus (*Arch. Hyg., 51 (1904), No. 2, pp. 97–128, figs. 2*).—The author studied the bacteria of decay and the chemical products produced with special reference to the decay of flesh. From decayed flesh he isolated 2 sorts of bacilli, either one of which broke down fibrin with the characteristic products of putrefactive decomposition. Both of these were obligate-endosporus-

anaerobic micro-organisms. The experiments and conclusions are discussed at length.

The changes which preserved eggs undergo on storage, M. WINTGEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 529–535*).—Preserved egg yolk was examined after storage with a view to determining its fitness for making egg noodles and similar goods. The conclusion was reached that the fitness of such a product for this purpose should be judged by the same methods as would be used with egg noodles.

Further analyses of fruit juice and berries, A. BEYTHIEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 544–548*).—Analyses are reported of raspberry, strawberry, and currant juice, and fruit.

Concerning the composition of fruit juices and fruit sirups, A. JUCKENACK and R. PASTERNACK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 548–554*).—Analytical data are reported.

The composition of orange juice, K. FARNSTEINER and W. STÜBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 10, pp. 603–605*).—Analyses are reported, including mineral constituents.

The occurrence of sulphurous acid in wine, W. KERP (*Arb. K. Gesundheits, 21 (1904), pp. 141–179; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 209–213*).—The literature of the subject is summarized and results of investigations reported.

Government inspection of vanilla beans in Tahiti, W. F. DOTY (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 289, p. 17*).—It is pointed out that it is now possible to submit vanilla beans for Government inspection and that those of the proper quality can be packed and sealed for export in the presence of a Government expert.

The influence of the hardness of water upon tea infusion, P. LASCHTSCHENKOW (*Farmazeft, 11 (1903), pp. 1234, 1235, 1271–1274, 1305–1308; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 590, 591*).—The author added various salts to the water used in tea making, and found that the alkaline carbohydrates had a favorable effect on the physical properties of the tea infusion. The sulphates of the alkalies and alkali earths gave a light-colored infusion, but did not injure the taste or affect the clearness.

The halogen salts of alkali and alkaline earths did not have any marked effect under the experimental conditions. Free calcium carbonate had a decidedly bad effect, an infusion made from water of 15° of hardness being unfit for use.

The vegetarian cookbook, E. G. FULTON (*Oakland, Cal.: Pacific Press Pub. Co., 1904, pp. 266*).—In this volume the term "vegetarian" means abstinence from flesh foods. The numerous receipts given include the preparation of fruits, vegetables, etc., in many ways, as well as dishes in which eggs, milk, and milk products are used.

Concerning the metabolism of phosphorus, L. F. MEYER (*Ztschr. Physiol. Chem., 43 (1904), No. 1–2, pp. 1–10*).—From experiments with dogs the conclusion was reached that increasing the amount of phosphorus in the food increases the amount retained in the body. The conclusion of other investigators was confirmed that the body can for long periods either gain or lose large quantities of phosphorus.

The chemical union and effect of resorbed phosphorus in the body, I, V. PLAVEC (*Arch. Physiol. [Pflüger], 104 (1904), No. 1–2, pp. 1–63*).—The union of free phosphorus with egg yolk, egg white, and other bodies of animal origin was studied, as well as the behavior of free phosphorus when taken into the body.

Can calcium stearate be resorbed in the small intestine, E. A. KNAUER (*Arch. Physiol. [Pflüger], 104 (1904), No. 1–2, pp. 89–108*).—The experiments reported led to the conclusion that there is no proof of the resorption of potassium soaps by the living intestinal wall.

The blood constituents rendered visible by ultramicroscopic methods, E. RÄHLMANN (*Deut. Med. Wchnschr., 30 (1904), Nos. 29, p. 1049; 33, p. 1219; abs. in Zentbl. Physiol., 18 (1904), No. 17, pp. 537, 538*).—Using Siedentopf and Zsigmondy's ultramicroscope (E. S. R., 16, p. 15), the author states that he was able to identify proto-plasmic bodies with active motion, formed from the leucocytes. The various stages of the formation of a different sort of body from the erythrocytes was also noted, as well as the presence of round swimming bodies in the fresh serum, and other phenomena otherwise not visible.

The conclusion was drawn that proteid exists in the blood and body fluids in minute particles and not in solution, and that, therefore, the cleavage products of the blood cells, according to the needs of the body and the rapidity of the circulation, may be supposed to serve to regulate metabolism.

ANIMAL PRODUCTION.

Steamed silage, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 34–38*).—In continuing the work with steamed silage (E. S. R., 14, p. 278), large as well as small silos were used. The sugar, acidity, and moisture were determined in the fresh material and at frequent intervals when the silage was removed from the silo, samples being reserved in all cases for complete analysis.

In the case of cut vetch and whole and cut clover the acid in the fresh material before ensiling ranged from 0.18 to 0.27 per cent, calculated as acetic acid, and in the steamed silage when taken from the silo from 0.42 to 0.88 per cent. The sugar in the fresh material ranged from 1.36 per cent to 2.07 per cent, and in the silage from 0.93 to 2.08 per cent. In a test in which the silage was not steamed the fresh clover contained 0.18 per cent acid and the ensiled material 1.01 per cent, the proportions of sugar in the fresh and ensiled material being 1.82 per cent and 0.75 per cent. Another sample of ensiled clover, which was not steamed, contained 1.16 per cent acid.

In one of the tests of steamed silage immature corn fodder which had been touched by frost was used. Full analyses of the fresh and ensiled material are reported, the acid in the silage being determined at intervals of a week for about 2 months. The fresh material contained 0.18 per cent acid and 2.43 per cent sugar, and the material when taken from the silo 0.48 per cent acid and 2.15 per cent sugar. For purposes of comparison a full analysis was made of ordinary corn silage. This contained 1.65 per cent acid and 0.49 per cent sugar. A comparison of the two materials led the author to conclude that the ordinary silage "underwent considerably more chemical or biological changes than did the steamed silage, these changes being indicated by the large increase in acidity and decrease in sugar." The steamed corn silage was fed to stock and was found to have suffered very little injury from the frost.

As regards steamed silage in general, the author considers that "the operation was quite beneficial and the steamed silage was much better than that which was not steamed. Stall-fed animals were able to eat, without the least injury, 50 to 75 lbs. of this steamed silage per day."

Protein in vetch hay, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 45, 46*).—The protein in single stalks of 10 samples of common vetch (*Vicia sativa*) was determined, all the plants being gathered when the lower pods were well formed but before the seed had begun to develop. The amount of protein in the dry matter ranged from 14.63 to 21.31 per cent.

"These results show that there is a wide variation in the percentage of protein in vetch and it is believed that by careful, systematic selection, the vetch plant can be improved and made more valuable for feeding purposes. It would cost no more to produce vetch hay containing 20 per cent or more of protein than it does to produce hay containing 12 to 16 per cent." The author states that this question will be further studied.

Acorns, beechnuts, and horse-chestnuts as cattle feeds, SCHILLER-TIETZ (*Fühling's Landw. Ztg., 53 (1904), No. 21, pp. 808–813*).—Data on the feeding value of acorns, beechnuts, and horse-chestnuts are summarized. In regard to the last mentioned the author calls attention to the fact that they are eaten readily by wild animals and by sheep, swine, and cows and less readily by horses. They may also be used for feeding carp, but should be cooked. Removing the brown shell is recommended as this is especially bitter. Methods of feeding and related topics are also spoken of.

The forest as a source of forage; practical directions for feeding brush, PAESSLER (*La forêt et la disette des fourrages.—Instruction pratique sur la ramille alimentaire. Paris: Librairie Agricole de la Maison Rustique; rev. in Jour. Agr. Prat., n. ser., 8 (1904), No. 43, p. 536*).—The feeding value of different sorts of brush is spoken of.

On the valuation of concentrated feeding stuffs, G. FAYE (*Ugeskr. Landm., 49 (1904), No. 13, pp. 172–176*).—By use of the method of least squares the author calculates the relative cost of protein, nitrogen-free extract, and fat in concentrated feeding stuffs to be as 1.6:2.6:1. The calculation is based on the average Danish market prices of 14 different feeding stuffs.—F. W. WOLL.

The digestibility and manurial value of purchased feeding stuffs, A. SMETHAM (*Separate from Roy. Lancashire Agr. Soc. Jour., 1902, pp. 16*).—In connection with a discussion of the feeding and manurial value of grains, cakes, etc., the results of a large number of the author's analyses of feeding stuffs are quoted.

"Food units" as a means of comparing purchased foods, A. SMETHAM (*Separate from Roy. Lancashire Agr. Soc. Jour., 1904, pp. 12*).—A method of calculating the comparative value of feeding stuffs is proposed, which takes into account both the manurial and feeding value.

Analyses of feeding stuffs, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 46–48*).—Analyses are reported of samples of prepared cattle food, wheat bran, cocoanut-cake meal, bunch grass (*Agropyrum divergens*), fresh and bleached, and vetch seed. The percentage composition of the vetch seed was as follows: Water 13.03, protein 26.04, fat 1.10, nitrogen-free extract 54.12, crude fiber 2.84, and ash 2.87 per cent.

Inspection of concentrated commercial feeding stuffs, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Rpt. 1904, pp. 327–338, 374–376*).—A list of the concentrated commercial feeding stuffs licensed for sale in the State during the year is given and a summary of a number of analyses which were made of such feeds is reported.

Attention is especially directed to the analyses of ground corn and oats. Of the 26 samples examined 2 were considered suspicious, since they contained more than 7 per cent of crude fiber, while one was regarded as adulterated, as its crude fiber content was over 9 per cent. On the whole, the authors consider that there is a marked improvement in the ground corn and oats offered for sale in the State. The Wisconsin feeding-stuff law is quoted.

Feeding sugar in the form of dried beets, A. MÜNTZ and A. C. GIRARD (*Ann. Inst. Nat. Agron., 2. ser., 3 (1904), No. 2, pp. 181–221*).—Sugar as part of a ration is discussed at some length, and the possibility of feeding this material in the form of dried beets is considered. Analyses of dried beets are reported and the results of tests in which this material formed part of the ration of horses for 4 weeks, the amount of sugar thus furnished daily ranging from 573 gm. in the first week to 2,292 gm. in the fourth week. The horses remained in excellent condition and the authors concluded that dried beets may be advantageously introduced into a ration for horses.

Further feeding experiments with dried potatoes, W. SCHNEIDEWIND (*Illus. Landw. Ztg., 24 (1904), No. 10, pp. 93, 94*).—Continuing earlier tests (E. S. R., 15, p. 806), experiments were made with pigs and steers. The potatoes were not found to be as satisfactory for pigs as ground barley and Indian corn, especially from the standpoint of economy. With steers fed dried potatoes fairly good results were

obtained. The fact is pointed out that this feeding stuff was better digested by steers than by pigs. The finely ground product is regarded as preferable to one which is coarsely ground.

The feeding of farm animals with molasses at Noyelles-sur-Escaut, H. HITIER (*Jour. Agr. Prat., n. ser., 8 (1904), No. 36, pp. 302–304*).—The successful feeding of molasses as part of a ration for horses and draft oxen is noted.

Animal husbandry, J. WITHYCOMBE (*Oregon Sta. Rpt. 1903, pp. 24–28*).—The author states that in general the work of the department of animal husbandry has been in connection with fattening pigs, feeding dairy cows and sheep, and soiling cows and pigs.

"An appreciable increase in the annual yield of milk from the station herd has occurred since the adoption of soiling instead of permitting the cows to run on pasture. The soiling of hogs with alfalfa has not been satisfactory; which is apparently due to the tendency of the plant to rapidly develop woody substance, thus lessening its palatability. Rape and other tender, succulent forage gave satisfactory results."

In a test undertaken to learn the cost of feeding a cow for beef it was found that there was a gain of 265 lbs. in 114 days, a pound of gain requiring 4.02 lbs. of mill feed (wheat bran, linseed-cake meal, and crushed wheat 2:1:1), 2.76 lbs. of mixed clover and grass hay, and 14.11 lbs. of steamed vetch, clover, and corn silage. The author calculates that there was a net profit of $3.71. The dressed carcass was 54 per cent of the live weight.

A test was undertaken to determine whether a dry cow can be maintained in good condition during the winter without concentrated feed, a 4-year-old Shorthorn in excellent condition being selected. The ration consisted of mixed clover and grass hay with steamed clover, vetch, and corn silage. The total amounts consumed in 4 months, beginning January 1, were 1,595 lbs. of hay and 1,420 lbs. of silage. During this time there was a total gain of 25 lbs. "It will be noted that the cow was wintered very inexpensively."

In a test with calves a calf feeder was compared with the usual method of allowing them to drink from a bucket. In the 91 days of the test a calf weighing 120 lbs. gained 122 lbs. when fed from a bucket and another animal weighing 95 lbs. at the start gained 130 lbs., while a calf weighing 64 lbs. at the beginning of the test and fed with a calf feeder gained 128 lbs. All were given 6 lbs. of new milk night and morning with as much mill feed and hay as they would consume.

The healthfulness of silage for sheep is a matter regarding which opinions differ, so a test was undertaken with a flock of 25 breeding ewes and a ram. They were fed all the steamed vetch and clover silage they would eat with about 0.5 lb. of oats per head per day in addition. During the 48 days of the test the sheep gained 122 lbs., consuming 6.58 lbs. of silage and 0.48 lb. of oats per pound of gain. With the exception of 1 animal the flock was apparently in the best of health at the close of the experiment.

The tests with pigs have been noted from a previous publication (E. S. R., 16, p. 84).

Experiments in beef production, W. J. KENNEDY ET AL. (*Iowa Sta. Bul. 79, pp. 266–304*).—In the first of the 3 studies reported light, medium, and heavy grain rations were compared with 3 lots of 50 steers each, weighing not far from 1,075 lbs. per head at the beginning of the trial.

When on full feed it was the intention to give about 16 lbs. of grain per head per day to lot 1, about 20 lbs. to lot 2, and about 24 lbs. to lot 3, and this plan was followed in the main throughout the test, which covered 189 days. The grain fed was at first snapped corn, later shelled corn, and then corn meal. About the middle of the feeding period Buffalo gluten feed and later oil meal and oats formed a part of the ration. A variety of coarse fodder was used in the test, including wheat straw, oat straw, sheaf oats, and clover hay, only one sort being fed at a time.

The greatest gain, 322.7 lbs. per steer, was made on the heavy ration, and the gain in this case was most expensive, costing 9.21 cts. per pound. The smallest and cheapest gain, averaging 286.9 lbs. per steer and costing 8.99 cts. per pound, was made on the light grain ration. The greatest range in feed eaten per pound of gain was also noted with these 2 lots being 16.51 lbs. and 17.65 lbs. of dry matter per pound of gain, respectively.

Pigs (1 per steer) followed each lot, some grain being fed in addition to what they could gather. The greatest gain, 125.2 lbs., was made by those following the heavy-ration lot and the lowest gain, 114.8 lbs., by those following steers fed the light ration.

At the close of the test the animals were all sold and slaughtered, some data regarding the slaughter test of the steers being recorded. Taking into account the usual data for both steers and pigs, the authors calculate that the steers were fed in every case at a loss, the amount being greatest on the light ration, $6.31 per steer, and least on the heavy ration, $4.21 per steer.

The conclusions which were drawn follow:

"Gains on fattening cattle can be made at a smaller cost with light or medium grain rations than when heavy grain rations are fed. [In the time covered by the test] it does not appear to be possible to finish cattle on light or medium grain rations so as to sell at the top of the market or for so high a price as similar cattle fed on heavy grain rations. This difference in the selling price of the heavy grain ration cattle will more than offset the cheaper gains made by the steers fed on the light and medium rations, thus, in the end, making the feeding of the heavy grain rations the most profitable to the producer.

"Cattle fed on light grain rations will consume more roughage than those fed on medium or heavy grain rations. From the gains made by the hogs which followed the various lots of cattle it would appear that the cattle fed on light and medium grain rations made better use of their feed than did those fed on the heavy grain rations.

"In the feeding of cattle for beef production the cost of producing a pound of gain does not always indicate the most profitable ration, as the rate of gain and the selling price of the finished product must be considered."

In the second test southern and western steers were compared, to determine whether the change in climatic conditions affects the southern cattle unfavorably as has sometimes been claimed. Each lot contained 50 animals, the western cattle averaging about 1,000 lbs. and the southern cattle not far from 750 lbs. per head. Both lots were fed under similar conditions heavy grain rations, the character of the rations as regards both grain and coarse fodder being practically the same as in the above test.

In the 223 days covered by the trial the southern steers gained 410.6 lbs. each on an average, the cost of a pound of gain being 7.17 cts. and the dry matter required per pound of gain 11.52 lbs. In the case of the western steers the average gain was 378.1 lbs. per steer, the cost of a pound of gain 9.09 cts. and the dry matter eaten per pound of gain 17.33 lbs. Pigs followed each lot of steers under the same conditions as in the test noted above, those following the southern steers gaining on an average 124.1 lbs. and those following the western steers 138.9 lbs. per animal.

At the close of the test the animals were sold and slaughtered, the usual data being recorded. Taking into account all the conditions, the authors calculate that there was a loss of 43 cts. with the southern cattle and $5.04 with the western cattle. The data reported led to the conclusion that cattle from the southern ranges may be taken directly to the Iowa feed lots and used for feeding purposes, . . . and when fed on the same feed stuffs, under like conditions, will make gains in point of economy, equal to or greater than cattle from the western ranges. Furthermore, southern range cattle show a strong inclination to take on flesh rapidly, thus rounding out and maturing early.

Continuing earlier work (E. S. R., 14, p. 481), the desirability of supplementing corn by other feeds was tested with 5 lots of 50 steers each, averaging not far from 800 lbs. in weight. The supplementary feeds selected and the maximum amounts fed per head per day were as follows: Oil meal 4 lbs., cotton-seed meal 4 lbs., gluten feed 5 lbs., and dried blood 1.5 lbs. The basal ration was much the same as in the preceding tests, and pigs followed each lot of steers.

In the 189 days of the test the greatest gain, 367.2 lbs. per steer, was made by the lot on corn and oil meal, and the smallest gain, 334.9 lbs. per steer, by the lot on corn only. The greatest range in dry matter per pound of gain was also found with these 2 lots, 13.15 lbs. being noted with the oil-meal ration and 15.15 with the corn ration. The cost of a pound of gain ranged from 7.88 cts. on oil meal to 9.45 cts. on corn and dried blood.

The pigs and steers were slaughtered, some data of the slaughter test being recorded. Taking into account all the usual factors, the authors calculate that there was a loss ranging from 33 cts. with the corn-fed steers to $4.47 with those fed the blood meal. From this and the earlier trial some general conclusions are drawn, from which the following are quoted:

"The use of supplemental feed stuffs in fattening cattle results in an increased rate of gain, higher bloom, and in some cases in a lower cost per pound of gain, and higher prices for the finished cattle.

"It appears that gluten feed, oil meal, and cotton-seed meal are very satisfactory feed stuffs; that they are especially valuable in balancing the ration when the roughage used is rather inferior, such as straw; that dried blood can not be considered satisfactory from a practical standpoint, as the increased gain is very slight and wholly disproportionate to the cost.

"The extent to which these supplemental feeds may be profitably used depends upon the price of corn, the price of supplemental feed, and the kind of roughage in use. . . .

"Corn and good clover hay, while not furnishing a perfectly balanced ration, give very satisfactory gains, and under ordinary conditions may be expected to yield fully as satisfactory financial profits as when supplemental feeds are used.

"The feeder must himself determine whether to use such feeds, and in doing so must take into account the price of other feed stuffs, the price of supplemental feeds, the price of cattle, and the probable premium which the most highly finished cattle will command over cattle of good finish."

Analyses of the concentrated feeds used in the above experiments are reported.

Present methods of beef production, H. W. Mumford and L. D. Hall (*Illinois Sta. Circ. 79, pp. 10*).—A circular letter requesting information on a number of points connected with cattle raising was addressed to a large number of feeders in Illinois and neighboring States, and the replies received are summarized and discussed. Some of the more important deductions follow:

A significant fact brought out is that a large percentage of Illinois breeders and feeders of cattle are convinced of the need of better blood in the cattle handled. It has been estimated that only about 15 per cent of the native beef steers marketed in Chicago are carried from birth to maturity without changing hands and this estimate seems to be borne out by the data secured in this investigation.

Apparently no constant relation can be found between the value of land in any locality and the proportion of cattle bred or fed there, nor did the data show that distance from the cattle markets had any uniform effect on the number of cattle raised. It was apparently true, however, that the principal beef-producing sections are those in which corn is most extensively grown. The authors believe that under average Illinois conditions it is rarely good practice to carry stock cattle a considerable time on a maintenance ration, even though subsequent gains on grass are increased thereby. The average daily gain secured with yearlings on grass alone,

Acorns, beechnuts, and horse-chestnuts as cattle feeds, SCHILLER-TIETZ (*Fühling's Landw. Ztg., 53 (1904), No. 21, pp. 808-813*).—Data on the feeding value of acorns, beechnuts, and horse-chestnuts are summarized. In regard to the last mentioned the author calls attention to the fact that they are eaten readily by wild animals and by sheep, swine, and cows and less readily by horses. They may also be used for feeding carp, but should be cooked. Removing the brown shell is recommended as this is especially bitter. Methods of feeding and related topics are also spoken of.

The forest as a source of forage; practical directions for feeding brush, PAESSLER (*La forêt et la disette des fourrages.—Instruction pratique sur la ramille alimentaire. Paris: Librairie Agricole de la Maison Rustique; rev. in Jour. Agr. Prat., n. ser., 8 (1904), No. 43, p. 536*).—The feeding value of different sorts of brush is spoken of.

On the valuation of concentrated feeding stuffs, G. FAYE (*Ugeskr. Landm., 49 (1904), No. 13, pp. 172-176*).—By use of the method of least squares the author calculates the relative cost of protein, nitrogen-free extract, and fat in concentrated feeding stuffs to be as 1.6:2.6:1. The calculation is based on the average Danish market prices of 14 different feeding stuffs.—F. W. WOLL.

The digestibility and manurial value of purchased feeding stuffs, A. SMETHAM (*Separate from Roy. Lancashire Agr. Soc. Jour., 1902, pp. 16*).—In connection with a discussion of the feeding and manurial value of grains, cakes, etc., the results of a large number of the author's analyses of feeding stuffs are quoted.

"Food units" as a means of comparing purchased foods, A. SMETHAM (*Separate from Roy. Lancashire Agr. Soc. Jour., 1904, pp. 12*).—A method of calculating the comparative value of feeding stuffs is proposed, which takes into account both the manurial and feeding value.

Analyses of feeding stuffs, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 46-48*).—Analyses are reported of samples of prepared cattle food, wheat bran, cocoanut-cake meal, bunch grass (*Agropyrum divergens*), fresh and bleached, and vetch seed. The percentage composition of the vetch seed was as follows: Water 13.03, protein 26.04, fat 1.10, nitrogen-free extract 54.12, crude fiber 2.84, and ash 2.87 per cent.

Inspection of concentrated commercial feeding stuffs, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Rpt. 1904, pp. 327-338, 374-376*).—A list of the concentrated commercial feeding stuffs licensed for sale in the State during the year is given and a summary of a number of analyses which were made of such feeds is reported.

Attention is especially directed to the analyses of ground corn and oats. Of the 26 samples examined 2 were considered suspicious, since they contained more than 7 per cent of crude fiber, while one was regarded as adulterated, as its crude fiber content was over 9 per cent. On the whole, the authors consider that there is a marked improvement in the ground corn and oats offered for sale in the State. The Wisconsin feeding-stuff law is quoted.

Feeding sugar in the form of dried beets, A. MÜNTZ and A. C. GIRARD (*Ann. Inst. Nat. Agron., 2. ser., 3 (1904), No. 2, pp. 181-221*).—Sugar as part of a ration is discussed at some length, and the possibility of feeding this material in the form of dried beets is considered. Analyses of dried beets are reported and the results of tests in which this material formed part of the ration of horses for 4 weeks, the amount of sugar thus furnished daily ranging from 573 gm. in the first week to 2,292 gm. in the fourth week. The horses remained in excellent condition and the authors concluded that dried beets may be advantageously introduced into a ration for horses.

Further feeding experiments with dried potatoes, W. SCHNEIDEWIND (*Illus. Landw. Ztg., 24 (1904), No. 10, pp. 93, 94*).—Continuing earlier tests (E. S. R., 15, p. 806), experiments were made with pigs and steers. The potatoes were not found to be as satisfactory for pigs as ground barley and Indian corn, especially from the standpoint of economy. With steers fed dried potatoes fairly good results were

obtained. The fact is pointed out that this feeding stuff was better digested by steers than by pigs. The finely ground product is regarded as preferable to one which is coarsely ground.

The feeding of farm animals with molasses at Noyelles-sur-Escaut, H. Hitier (*Jour. Agr. Prat., n. ser., 8 (1904), No. 36, pp. 302–304*).—The successful feeding of molasses as part of a ration for horses and draft oxen is noted.

Animal husbandry, J. Withycombe (*Oregon Sta. Rpt. 1903, pp. 24–28*).—The author states that in general the work of the department of animal husbandry has been in connection with fattening pigs, feeding dairy cows and sheep, and soiling cows and pigs.

"An appreciable increase in the annual yield of milk from the station herd has occurred since the adoption of soiling instead of permitting the cows to run on pasture. The soiling of hogs with alfalfa has not been satisfactory; which is apparently due to the tendency of the plant to rapidly develop woody substance, thus lessening its palatability. Rape and other tender, succulent forage gave satisfactory results."

In a test undertaken to learn the cost of feeding a cow for beef it was found that there was a gain of 265 lbs. in 114 days, a pound of gain requiring 4.02 lbs. of mill feed (wheat bran, linseed-cake meal, and crushed wheat 2:1:1), 2.76 lbs. of mixed clover and grass hay, and 14.11 lbs. of steamed vetch, clover, and corn silage. The author calculates that there was a net profit of $3.71. The dressed carcass was 54 per cent of the live weight.

A test was undertaken to determine whether a dry cow can be maintained in good condition during the winter without concentrated feed, a 4-year-old Shorthorn in excellent condition being selected. The ration consisted of mixed clover and grass hay with steamed clover, vetch, and corn silage. The total amounts consumed in 4 months, beginning January 1, were 1,595 lbs. of hay and 1,420 lbs. of silage. During this time there was a total gain of 25 lbs. "It will be noted that the cow was wintered very inexpensively."

In a test with calves a calf feeder was compared with the usual method of allowing them to drink from a bucket. In the 91 days of the test a calf weighing 120 lbs. gained 122 lbs. when fed from a bucket and another animal weighing 95 lbs. at the start gained 130 lbs., while a calf weighing 64 lbs. at the beginning of the test and fed with a calf feeder gained 128 lbs. All were given 6 lbs. of new milk night and morning with as much mill feed and hay as they would consume.

The healthfulness of silage for sheep is a matter regarding which opinions differ, so a test was undertaken with a flock of 25 breeding ewes and a ram. They were fed all the steamed vetch and clover silage they would eat with about 0.5 lb. of oats per head per day in addition. During the 48 days of the test the sheep gained 122 lbs., consuming 6.58 lbs. of silage and 0.48 lb. of oats per pound of gain. With the exception of 1 animal the flock was apparently in the best of health at the close of the experiment.

The tests with pigs have been noted from a previous publication (E. S. R., 16, p. 84).

Experiments in beef production, W. J. Kennedy et al. (*Iowa Sta. Bul. 79, pp. 266–304*).—In the first of the 3 studies reported light, medium, and heavy grain rations were compared with 3 lots of 50 steers each, weighing not far from 1,075 lbs. per head at the beginning of the trial.

When on full feed it was the intention to give about 16 lbs. of grain per head per day to lot 1, about 20 lbs. to lot 2, and about 24 lbs. to lot 3, and this plan was followed in the main throughout the test, which covered 189 days. The grain fed was at first snapped corn, later shelled corn, and then corn meal. About the middle of the feeding period Buffalo gluten feed and later oil meal and oats formed a part of the ration. A variety of coarse fodder was used in the test, including wheat straw, oat straw, sheaf oats, and clover hay, only one sort being fed at a time.

The greatest gain, 322.7 lbs. per steer, was made on the heavy ration, and the gain in this case was most expensive, costing 9.21 cts. per pound. The smallest and cheapest gain, averaging 286.9 lbs. per steer and costing 8.99 cts. per pound, was made on the light grain ration. The greatest range in feed eaten per pound of gain was also noted with these 2 lots being 16.51 lbs. and 17.65 lbs. of dry matter per pound of gain, respectively.

Pigs (1 per steer) followed each lot, some grain being fed in addition to what they could gather. The greatest gain, 125.2 lbs., was made by those following the heavy-ration lot and the lowest gain, 114.8 lbs., by those following steers fed the light ration.

At the close of the test the animals were all sold and slaughtered, some data regarding the slaughter test of the steers being recorded. Taking into account the usual data for both steers and pigs, the authors calculate that the steers were fed in every case at a loss, the amount being greatest on the light ration, $6.31 per steer, and least on the heavy ration, $4.21 per steer.

The conclusions which were drawn follow:

"Gains on fattening cattle can be made at a smaller cost with light or medium grain rations than when heavy grain rations are fed. [In the time covered by the test] it does not appear to be possible to finish cattle on light or medium grain rations so as to sell at the top of the market or for so high a price as similar cattle fed on heavy grain rations. This difference in the selling price of the heavy grain ration cattle will more than offset the cheaper gains made by the steers fed on the light and medium rations, thus, in the end, making the feeding of the heavy grain rations the most profitable to the producer.

"Cattle fed on light grain rations will consume more roughage than those fed on medium or heavy grain rations. From the gains made by the hogs which followed the various lots of cattle it would appear that the cattle fed on light and medium grain rations made better use of their feed than did those fed on the heavy grain rations.

"In the feeding of cattle for beef production the cost of producing a pound of gain does not always indicate the most profitable ration, as the rate of gain and the selling price of the finished product must be considered."

In the second test southern and western steers were compared, to determine whether the change in climatic conditions affects the southern cattle unfavorably as has sometimes been claimed. Each lot contained 50 animals, the western cattle averaging about 1,000 lbs. and the southern cattle not far from 750 lbs. per head. Both lots were fed under similar conditions heavy grain rations, the character of the rations as regards both grain and coarse fodder being practically the same as in the above test.

In the 223 days covered by the trial the southern steers gained 410.6 lbs. each on an average, the cost of a pound of gain being 7.17 cts. and the dry matter required per pound of gain 11.52 lbs. In the case of the western steers the average gain was 378.1 lbs. per steer, the cost of a pound of gain 9.09 cts. and the dry matter eaten per pound of gain 17.33 lbs. Pigs followed each lot of steers under the same conditions as in the test noted above, those following the southern steers gaining on an average 124.1 lbs. and those following the western steers 138.9 lbs. per animal.

At the close of the test the animals were sold and slaughtered, the usual data being recorded. Taking into account all the conditions, the authors calculate that there was a loss of 43 cts. with the southern cattle and $5.04 with the western cattle. The data reported led to the conclusion that cattle from the southern ranges may be taken directly to the Iowa feed lots and used for feeding purposes, . . . and when fed on the same feed stuffs, under like conditions, will make gains in point of economy, equal to or greater than cattle from the western ranges. Furthermore, southern range cattle show a strong inclination to take on flesh rapidly, thus rounding out and maturing early.

Continuing earlier work (E. S. R., 14, p. 481), the desirability of supplementing corn by other feeds was tested with 5 lots of 50 steers each, averaging not far from 800 lbs. in weight. The supplementary feeds selected and the maximum amounts fed per head per day were as follows: Oil meal 4 lbs., cotton-seed meal 4 lbs., gluten feed 5 lbs., and dried blood 1.5 lbs. The basal ration was much the same as in the preceding tests, and pigs followed each lot of steers.

In the 189 days of the test the greatest gain, 367.2 lbs. per steer, was made by the lot on corn and oil meal, and the smallest gain, 334.9 lbs. per steer, by the lot on corn only. The greatest range in dry matter per pound of gain was also found with these 2 lots, 13.15 lbs. being noted with the oil-meal ration and 15.15 with the corn ration. The cost of a pound of gain ranged from 7.88 cts. on oil meal to 9.45 cts. on corn and dried blood.

The pigs and steers were slaughtered, some data of the slaughter test being recorded. Taking into account all the usual factors, the authors calculate that there was a loss ranging from 33 cts. with the corn-fed steers to $4.47 with those fed the blood meal. From this and the earlier trial some general conclusions are drawn, from which the following are quoted:

"The use of supplemental feed stuffs in fattening cattle results in an increased rate of gain, higher bloom, and in some cases in a lower cost per pound of gain, and higher prices for the finished cattle.

"It appears that gluten feed, oil meal, and cotton-seed meal are very satisfactory feed stuffs; that they are especially valuable in balancing the ration when the roughage used is rather inferior, such as straw; that dried blood can not be considered satisfactory from a practical standpoint, as the increased gain is very slight and wholly disproportionate to the cost.

"The extent to which these supplemental feeds may be profitably used depends upon the price of corn, the price of supplemental feed, and the kind of roughage in use. . . .

"Corn and good clover hay, while not furnishing a perfectly balanced ration, give very satisfactory gains, and under ordinary conditions may be expected to yield fully as satisfactory financial profits as when supplemental feeds are used.

"The feeder must himself determine whether to use such feeds, and in doing so must take into account the price of other feed stuffs, the price of supplemental feeds, the price of cattle, and the probable premium which the most highly finished cattle will command over cattle of good finish."

Analyses of the concentrated feeds used in the above experiments are reported.

Present methods of beef production, H. W. MUMFORD and L. D. HALL (*Illinois Sta. Circ. 79, pp. 10*).—A circular letter requesting information on a number of points connected with cattle raising was addressed to a large number of feeders in Illinois and neighboring States, and the replies received are summarized and discussed. Some of the more important deductions follow:

A significant fact brought out is that a large percentage of Illinois breeders and feeders of cattle are convinced of the need of better blood in the cattle handled. It has been estimated that only about 15 per cent of the native beef steers marketed in Chicago are carried from birth to maturity without changing hands and this estimate seems to be borne out by the data secured in this investigation.

Apparently no constant relation can be found between the value of land in any locality and the proportion of cattle bred or fed there, nor did the data show that distance from the cattle markets had any uniform effect on the number of cattle raised. It was apparently true, however, that the principal beef-producing sections are those in which corn is most extensively grown. The authors believe that under average Illinois conditions it is rarely good practice to carry stock cattle a considerable time on a maintenance ration, even though subsequent gains on grass are increased thereby. The average daily gain secured with yearlings on grass alone,

according to the data collected, was 1.66 lbs., and in the case of 2-year-olds it was 1.87 lbs.

As regards breeds most in favor, about 50 per cent of the correspondents stated that Shorthorns gave the best returns; about 20 per cent favored Herefords, and 18 per cent Angus. About 50 per cent of those who replied preferred 2-year-olds for stock cattle and feeders, the remainder being about equally divided in their preference for older and younger animals. As regards weight, some 40 per cent of the correspondents preferred cattle weighing from 800 to 1,000 lbs. for stockers and feeders; 26 per cent favored those weighing less than 800 lbs., and 34 per cent 1,000 lbs. or over.

Information was also sought regarding the feeding of spayed heifers and less than one-third of those who replied had made the attempt. "Of those who sometimes used heifers as feeders about one-half report that they have been able to realize as much profit from feeding them as from feeding steers."

The food value of a pound of milk solids, C. L. BEACH (*Connecticut Storrs Sta. Bul. 31, pp. 16, figs. 14*).—The food value for young animals of milk carrying different percentages of fat was studied with calves, pigs, and lambs.

In the case of calves, which were being reared for dairy animals, 1.33 lbs. total solids from milk with 5.1 per cent fat was required per pound of gain in a test covering 53 days as compared with 1.16 lbs. from milk carrying 3.27 per cent fat fed for 63 days. In the case of 2 calves, each fed for 30 days, 0.91 lb. total milk solids from milk carrying 3.27 per cent fat was required per pound of gain, as compared with 1.03 lbs. from milk with 4.6 per cent fat.

In the first test with pigs 2 animals fed skim milk gained 62 lbs. in 40 days. Two similar animals receiving milk poor in fat (containing 3.54 per cent) gained 54.8 lbs., while 2 animals fed milk rich in fat (containing 5.2 per cent) gained 42.2 lbs. Throughout the remainder of the test, which covered 70 days, a similar ratio was noted. Some data are given regarding the total solids required per pound of gain. An idea of the relative amounts may be gathered from the fact that from the fortieth to the fiftieth day of the feeding period 1.48 lbs. of milk solids were required per pound of gain when supplied by skim milk, 1.18 lbs. by milk poor in fat, and 2 lbs. by milk rich in fat. In every case the milk was fed ad libitum.

In a second test under practically the same conditions with 3 lots of 2 pigs each the lot receiving skim milk gained 72 lbs. in 30 days; the lot fed milk poor in fat (3.3 per cent) gained 58 lbs. and the pair fed milk rich in fat (5.7 per cent) gained 50 lbs. The total solids required per pound of gain in the 3 cases were 1.48, 1.40, and 1.56 lbs., respectively. At the end of the test one of the pigs fed milk poor in fat and one of those fed milk rich in fat were slaughtered, the dressed weight in the 2 cases being 65 and 70 per cent of the live weight, respectively. The weight of the liver, spleen, and blood were practically the same in the 2 cases. The sixth rib of each pig was analyzed, showing 21.25 per cent fat in the skim milk fed pig and 35.68 per cent in the pig fed rich milk. The pig fed the milk with low fat content had 1.78 per cent more lean meat, 11.93 per cent more water, and 14.43 per cent less fat than the other.

In a test with lambs a lot of 2 animals gained 37.7 lbs. in 60 days on milk containing 3 per cent fat as compared with 30.4 lbs. in the case of a lot of 2 animals fed milk containing 5.6 per cent fat, the total milk solids required per pound of gain being 1.08 lbs. and 1.37 lbs. In addition to milk each lot consumed 36 lbs. of hay.

Considering the tests with all the animals, the author calculates that 1.22 lbs. of milk solids from milk poor in fat is required per pound of gain as compared with 1.47 lbs. from milk rich in fat. The results of some studies regarding the size of fat globules in milk are also reported.

The general conclusions drawn from the investigation as a whole follow:

"These experiments were made with young animals, in which, no doubt, the digestive fluids were not in full and active operation.

"To produce 1 lb. of gain in live weight in these young animals more total solids were required with the milk rich in butter fat than with the milk poor in butter fat.

"Later in the trials with pigs fed rich milk ad libitum serious digestive disturbances were noticed.

"The failure of a pound of milk solids in rich milk to make equal or better gains than a pound of solids in the poor milk was not due apparently to lack of nitrogenous material, but rather to the excess of fat or to the character of the fat.

"Larger fat globules were found in the richer milk, and this fact, in connection with the digestive disturbances, would seem to indicate the reason for the larger gains from a pound of solids with the poorer milk."

Cattle raising on the plains, J. E. PAYNE (*Colorado Sta. Bul. 87, pp. 7-17*).—In addition to a brief account of the history of cattle raising on the Great Plains of Colorado, the author discusses range improvement, winter feeding, shelter, diseases, the financial possibilities of stock raising, and related topics. As regards the value of pastures *v.* open range he states that few have tried the plan on the Colorado plains, but that when tested in Texas it increased the value of the pasture quite rapidly. In such a system the supply of water is the important matter and would have to be secured by digging wells.

The need of feeding in winter is discussed. "It has been the experience of cattlemen that after they have begun feeding an animal the feeding must be continued until the grass comes. It is also better to feed the weak animals full feed instead of trying to make them rustle for a part of their living. If given a partial feed they die and all that is given them is lost, while if well fed and sheltered they get through the winter in good shape and are soon equal to the stronger cattle that rustled all winter." The need of shelter for range cattle is insisted upon.

In the author's opinion, the so-called loco poisoning is a consequence of insufficient feed rather than the eating of any special poisonous plant.

The value of soy beans as a part of a grain ration for lambs, W. B. RICHARDS and F. KLEINHEINZ (*Wisconsin Sta. Rpt. 1904, pp. 51-55*).—The growing interest in soy beans led the authors to study their feeding value for lambs, the test reported, which covered 12 weeks, being made with 2 lots of 10 lambs each.

In addition to grain all the lambs were fed like rations of cut corn stover and clover hay, the latter being after a little replaced by June grass hay. On soy beans and corn meal 1:1 the average gain per lamb during the test was 16.3 lbs., the grain eaten per pound of gain 6.11 lbs., and the coarse fodder eaten per pound of gain 7.11 lbs. On oats and corn 1:1 the average gain per lamb was 13.7 lbs., and the grain and coarse fodder eaten per pound of gain 7.28 lbs. and 8.62 lbs., respectively.

"Soy beans in this trial have proved to be an excellent grain for balancing the grain ration of growing lambs. More experiments will be necessary before definite conclusions can be drawn. If the results continue to be as encouraging as those set forth in this experiment, extended use of soy beans for feeding purposes will depend upon how economical their production proves in this particular section."

Analyses are reported of the feeding stuffs used except the corn stover.

Exercise v. confinement for fattening sheep in winter, G. C. HUMPHREY and F. KLEINHEINZ (*Wisconsin Sta. Rpt. 1904, pp. 56-59*).—The value of exercise as a factor in fattening lambs in winter was studied. In the first test 2 lots of 10 lambs each were given exercise in a field or yard, while 2 similar lots were kept in pens, all being fed like rations of mixed grain, clover hay, and sugar beets.

In 13 weeks the lambs having the exercise made a total gain of 421 lbs., and those without exercise 409 lbs., the average cost of a pound of gain in each case being 11 cts. With exercise 6.52 lbs. grain and 14.8 lbs. of coarse fodder were required per pound of gain. Similar values for the lambs without exercise were 7.72 and 15.2 lbs. In a second test which was made under much the same conditions except that mangel-wurzels were substituted for beets, a lot of 16 lambs, with exercise, made a total

gain of 190 pounds, requiring 7.6 lbs. of grain and 29.1 lbs. of coarse fodder per pound of gain. In the case of a similar lot without exercise the total gain was 283 lbs. and the grain and coarse fodder required per pound of gain 5.1 lbs. and 19.6 lbs., respectively.

The relative cost of the feed per pound of gain in the 2 lots was 15.1 cts. and 10.2 cts. According to the authors, the results obtained in the two tests were in some respects contradictory, yet the average results for both trials are somewhat in favor of confinement for fattening sheep in winter. The data obtained up to the present time are not regarded as sufficient for final deductions.

Effect upon the lambs of feeding a mixed grain ration of corn, oats, and bran to pregnant ewes, W. B. Richards and F. Kleinheinz (*Wisconsin Sta. Rpt. 1904, pp. 60–66*).—Forty ewes from the station flock were divided into 4 uniform lots of 10 each and fed like rations of a mixture of equal parts of corn, oats, and bran with corn silage and hay, this test being a continuation of work previously reported in which ewes were fed a single grain (E. S. R., 14, p. 996). The gain in weight in the 11 weeks of the test ranged from 94 lbs. to 167 lbs., averaging 146.1 lbs. per lot. The average number of lambs per lot was 14, the average weight at birth 8.4 lbs., the percentage of strong lambs 86.7, of medium lambs 6.6, and of weak lambs 6.7.

The test is discussed at length and compared with the results of the earlier test referred to. In the authors' opinion the mixed grain ration tested is satisfactory for breeding ewes and is as economical as feeding a single grain, such as shelled corn, whole oats, wheat bran, or dried brewers' grains. When the milk supply of the ewes is considered a ration of dried brewers' grains gave better results than the mixed ration fed in the test reported. The average increase of lambs was greater in the case of the ewes fed a single grain ration, but the percentage of strong lambs was not as high as on a single grain.

"Corn silage with hay proved to be a good winter roughage ration for breeding ewes as in all trials previously made at this station." The milk supply of the ewes when the lambs were born was noted, 64.8 of them being rated as "good" in this respect. "Grouping the ewes in this experiment according to breeds shows that the Dorsets and Southdowns excel the other breeds in milk supply at the time of parturition. There is considerable difference shown between the different breeds used in the trial as regards percentage of increase in strength and weight of the lambs at birth. The number of some of the breeds represented, however, is too small to show any definite results regarding these points."

Sheep-shearing test at Hanover in 1903, C. Lehmann (*Arb. Deut. Landw. Gesell., 1904, No. 95, pp. 87, figs. 71*).—The detailed results of a sheep-shearing test are given. The average live weight of the 70 animals included was 59.53 kg. shorn and that of the unwashed fleece 5.41 kg.

Whole corn compared with corn meal for fattening pigs; eighth year trial, W. A. Henry (*Wisconsin Sta. Rpt. 1904, pp. 20–24*).—Continuing earlier work (E. S. R., 16, p. 86), whole corn was compared with the same corn ground using 2 lots of 4 pigs averaging 126 lbs. and 2 lots of 3 pigs each averaging 83 lbs. in weight.

In the 10 weeks of the test the total gain of the older pigs fed shelled corn was 208 lbs. and of the younger pigs 60 lbs., the feed required per pound of gain in each case being 5.48 lbs. and 7.38 lbs. In the case of corn meal the total gain of the older pigs was 246 lbs. and of the younger pigs 71 lbs., the feed required per pound of gain in the 2 cases being 5.72 lbs. and 8.2 lbs.

"So far as these trials are concerned, it is shown that in both cases there was a waste of food by reducing the corn to meal by grinding. . . . Mature hogs under confinement will show large gains for several weeks on the exclusive corn diet, but such gains are not long continued. Young growing pigs must build up bone and muscle if they are to increase materially in weight and grow normally; they can not secure from the corn grain the necessary food elements for the body structure,

and hence nature, soon turned awry, protests against this food by showing poor appetites, lack of gain, and other evidences of unthrift and malnutrition. . . .

"The results plainly show that corn, either ground or whole, should not be used exclusively with pigs or young hogs. So far as they are of any value otherwise, they show a positive disadvantage following the grinding of the corn to meal. So disastrous were the results that it is doubtful if we are warranted in continuing such experiments with pigs."

Some effects of feeding wide and narrow rations on the growth of young pigs, J. G. Fuller (*Wisconsin Sta. Rpt. 1904, pp. 25–31, figs. 2*).—Using 2 lots of 3 young pigs each, the feeding value of corn meal, mixed to a thick slop with water, and corn meal and wheat middlings 1:1, mixed with skim milk, was studied, the trial covering 110 days.

The total gain on corn meal was 130 lbs., the dry matter required per pound of gain 7.12 lbs., and the net profit 49 cts. On corn meal and middlings the total gain was 362 lbs., the dry matter eaten per pound of gain 3.33 lbs., and the net profit $5.90. Slaughter tests were made at the conclusion of the trial and also a careful dissection of the carcass and tests of the strength of bone with 1 pig from each lot. In the case of the corn-fed pigs the dressed weight was 72 per cent of the live weight and in the case of those fed a mixed ration it was 76 per cent.

The author states that the lean meat of the pigs fed the mixed ration was noticeably darker in color and showed better marbling than in the case of the pigs fed entirely on corn. On an average the thigh bones of the lot fed the mixed ration were 50 per cent stronger than of those fed the corn ration.

The author concludes that the constitution of all pigs fed corn only was seriously impaired and that it is impracticable to raise young pigs on an exclusive corn ration. "The feeding trial made dwarfed animals out of every pig in lot 1, fed exclusively on corn. While they gained some in flesh they did not develop in bone, and, as time went on, their vitality decreased. The hair on their bodies became thin and their skin hard and scaly. Toward the end of the trial they were indifferent about eating and showed considerable uneasiness."

Soy beans v. middlings as a supplement to corn meal for fattening pigs, G. C. Humphrey (*Wisconsin Sta. Rpt. 1904, pp. 32–40, figs. 4*).—Corn alone having proved unsatisfactory for pigs, the relative value of soy beans and middlings as a supplement to this grain was studied with 6 Improved Yorkshire pigs divided into 2 uniform lots of 3 animals each. The difficulty experienced in grinding the soy beans alone, the author states, was readily obviated when the beans and corn were mixed before grinding.

On corn and soy beans 2:1, the average daily gain per pig was 1.26 lbs. and the feed required per pound of gain 5.39 lbs., as compared with 1.08 lbs. and 6.08 lbs. on corn meal and middlings 2:1. At the close of the trial the pigs were slaughtered and the live and dressed weight, weight of the organs, etc., recorded. The dressed weight averaged 82 per cent on soy beans and 83.2 per cent on middlings. No marked differences were observed in the distribution of fat and lean on the carcasses, yet the author states that there was a slightly better development of lean meat in the case of the pigs fed the soy beans.

"No definite conclusions can be drawn from this single trial, and results of further trials will be sought with interest."

Pig feeding experiment, A. Goss (*Indiana Sta. Rpt. 1904, pp. 6, 7*).—A brief account is given of a feeding test with 4 lots of 4 pigs each. On corn only there was a total gain of 183 lbs. at a loss of 3 cts.; on corn and shorts 1:1 the total gain was 365 lbs. with a profit of $5.71; on corn and soy beans 2:1 the corresponding values were 402 lbs. and $5.66, and on corn and tankage 5:1 they were 348 lbs. and $4.49.

"It will be seen that the lot fed with corn and soy beans made considerably over double the gain in live weight made by the animals fed on corn alone, and the lots

fed shorts and tankage in addition to the corn made almost double the gain made by the lot fed corn alone. When the financial phase of the question is considered the differences are much more striking."

Animal husbandry, J. WITHYCOMBE (*Oregon Sta. Rpt. 1904, p. 26*).—In an account of the work of the animal husbandry department of the station a test of the feeding value of wheat chop and dried blood for pigs is briefly reported. In 50 days a lot of 6 pigs fed wheat chop gained 460 lbs., consuming 5.24 lbs. of chop per pound of gain. During the same time a similar lot gained 465 lbs., consuming 4.92 lbs. of wheat chop and 0.74 lb. of dried blood per pound of gain. "The dried blood as a supplementary feed with wheat was fed at a financial loss."

Poultry feeding and fattening, G. B. FISKE (*New York: Orange Judd Co., 1904, pp. 160, pl. 1, figs. 43*).—Chicken feeding, broiler raising, finishing and dressing capons, American fattening methods, preparation for market, and marketing turkeys and water fowl are some of the topics taken up in this concise volume on poultry raising.

The physiology of the gizzard of grain-eating birds, A. ZAITSCHEK (*Arch. Physiol. [Pflüger], 104 (1904), No. 9-12, pp. 608-611*).—In experiments with chickens fed for 10 weeks with and without the addition of grit, both lots showed about the same changes in weight. It is evident therefore that grit remains in the gizzard for a considerable time. The amount of grit in the gizzard of the birds fed none during the test was much smaller, and the pieces were more worn down and smoother than was found with the other lot.

In the case of intensive fattening of poultry, which lasts not more than 15 days, the feeding of grit the author concludes is unnecessary, since the gizzard will contain enough.

DAIRY FARMING—DAIRYING.

Experiments with dairy cows, D. H. OTIS (*Kansas Sta. Bul. 125, pp. 59-161, figs. 44*).—This bulletin includes the results of investigations at the station for a series of years and considerable general information on a variety of subjects. Some of the more important points discussed are noted below.

From statistics gathered by the State board of agriculture and covering a period of 10 years it is estimated that the average income of Kansas cows is \$9.62 per head. Data obtained from 82 creamery patrons showed a total yearly income per cow of \$32.86, the income from cows of the best herd being \$54.38 and the poorest \$18.04.

In 1898 the station purchased a herd of common cows, the records of which, along with illustrations of some of the cows as they appeared when purchased and later, are given in this bulletin. The average yearly production was 6,288.58 lbs. of milk and 251.24 lbs. of butter fat. The best 10 cows produced on an average 8,085.8 lbs. of milk and 337.19 lbs. of butter fat, and the poorest 10 cows 3,484.62 lbs. of milk and 142.08 lbs. of butter fat. The record of the best cow was 9,116 lbs. of milk and 383.7 lbs. of butter fat and of the poorest cow 2,463.1 lbs. of milk and 87.21 lbs. of butter fat.

At local prices for feeding stuffs the best cow showed a profit over cost of feed of \$40.37, and the poorest cow a loss of \$4.53. The cows materially improved in appearance by the good feeding and care received at the station. The effort is being made to grade up this herd by the use of pure-bred Guernsey bulls. Nine cows selected by practical dairymen were later added to the herd, and their records showing food consumption and milk production are reported, as are also the records of the pure-bred cows of different breeds kept at the station.

Data are given showing variations in the weight of animals; comparative yields of heavy, medium, and light cows; variations in the daily yield of milk; relative profits from long and short lactation periods; and cost of keeping cows. Cows of medium weight made the best records. The longest lactation periods showed the largest

profit. It is estimated that cows to be profitable must yield products to the amount of over $5.95 above the cost of feed.

Three dry cows, two 2-year-old heifers, and 3 calves were maintained for 1 month on 4,232 lbs. of wheat straw and 992 lbs. of ground wheat, the average loss in weight per head for the first week being 62 lbs. and for the month 13 lbs. At current prices it is estimated that wheat and wheat straw may be utilized in wintering cows at from $1.25 to $2.50 per head per month. Cows fed liberally on a ration containing plenty of protein showed only a small gain in yield in changing from dry feed to soiling crops or pasture, and no decrease in fat content. The possibility and economy of producing dairy feeds on the farm is illustrated. Rations for cows producing different quantities of milk are suggested.

Notes are given on a number of pasture and soiling crops for cows. The experience at the station indicates that on the whole it is unsafe to pasture cows on alfalfa. A test was made of an "alfalfa bit" designed to lessen the danger from bloating, and somewhat favorable results were obtained which were believed to be due to preventing the cows from eating the alfalfa so rapidly. In a comparison of pasturing and soiling it required 0.71 of an acre to support a cow on soiling crops 144 days, while on pasture it required 3.63 acres for the same period. The cows on pasture produced the most milk but also consumed the most grain. On the whole it was found possible to get over four times as much per acre by soiling as by pasturing.

Notes are given on the results of feeding experiments with corn silage, alfalfa silage and hay, clover, sorghum, Kafir corn, millet, and other crops, and also with different kinds of grain. Favorable results were obtained in putting the first cutting of alfalfa in the silo. Alfalfa hay was found more valuable than soy-bean hay. The experience at the station indicates that to a certain extent alfalfa can be made to take the place of bran. It has been found profitable to feed about 3 lbs. of grain per head to cows on pasture.

Considerable difference was found in the coagulability of the milk of different cows by rennet, from which it is argued that there is considerable difference in the digestibility of the milk of individual animals. It was found that the milk of one cow was not coagulated at all with the ordinary amount of rennet, and feeding such milk to a calf produced scouring.

Notes are given on water, shade, and barns for cows. A remedy devised by the station has been found quite effective in keeping flies away from cows. The mixture was made by dissolving 1½ lbs. resin in a solution of 2 cakes of laundry soap in water by heating, adding ½ pint fish oil and enough water to make 3 gals. Apply with a brush, or if used as a spray add ½ pt. kerosene.

The testing of milk, cream, and skim milk is discussed at some length, the Babcock test is described, and considerable data are given as regards variations in the fat test between the morning's and night's milk and during the lactation period, and variations due to feed, excitement, being in heat, and other influences.

Silage v. grain for dairy cows, C. G. Williams (*Ohio Sta. Bul. 155, pp. 63–80, figs. 4*).—A ration composed largely of mixed silage (corn, cowpeas, and soy beans) was compared with one consisting mainly of grain.

As actually consumed the silage ration consisted of 58 lbs. of silage, 6.8 lbs. of mixed hay, 2 lbs. of oil meal, and 2 lbs. of bran, and the grain ration of 4.7 lbs. of stover, 6.4 lbs. of mixed hay, 2.5 lbs. of oil meal, 5 lbs. of corn meal, and 6 lbs. of bran. The amount of dry matter was essentially the same in the two rations, although in the first over 82 per cent was derived from the roughage and in the second less than 43 per cent from the roughage. Ten cows were included in the test, only 5, however, remaining for the full period of 4 months.

The cows fed the silage ration produced 96.7 lbs. of milk and 5.08 lbs. of butter fat, and cows fed the grain ration 81.3 lbs. of milk and 3.9 lbs. of butter fat per 100 lbs. of dry matter consumed. It was also thought that the percentage of fat was main-

tained better by the silage-fed cows. On the silage ration the average net profit per cow over cost of feed was $5.86 per month and on the grain ration $2.46.

As compared with the period preceding the test, cows fed the silage ration shrank 2.84 per cent in milk production and gained 1.89 per cent in butter-fat production, while cows fed the grain ration shrank 9.11 per cent in milk and 14.18 per cent in butter-fat production. The average gain in live weight of the cows in each lot was respectively 47 and 57 lbs. per head. The results are believed to justify the conclusion that silage can be made to take the place of a considerable portion of the grain ration. It is planned to continue the experiments along this line.

Soy-bean silage as a food for dairy cows, F. W. Woll and G. C. Humphrey (*Wisconsin Sta. Rpt. 1904, pp. 67-74*).—Corn, corn and soy beans sown together in the ratio of about 6 to 1, and soy beans alone were siloed, and the relative value of the different forms of silage was tested with the entire university herd. Analyses of the crops and of the silage are reported.

Data are given for the successive feeding periods of about 2 weeks each in which the corn silage, the corn and soy bean mixture, soy-bean silage, and corn silage were fed ad libitum, and also for a final period of 2 weeks in which the cows were pastured. The mixed silage was eaten with nearly as much relish as the corn silage, but very much less of the soy-bean silage was eaten, three of the cows refusing to eat any. Notwithstanding an increase in the grain allowance during the soy-bean period, there was a decrease in the production of milk and butter fat of all the cows without exception.

In addition to its being less valuable for milk and butter production than corn silage, the following reasons are advanced against recommending soy-bean silage to the dairy farmer of the Northwest: (1) Less food substance is obtained from an acre of soy beans than from an acre of corn; (2) the soy-bean silage is not readily eaten, the refuse amounts to about 10 per cent, and the rank odor is very unpleasant; (3) the soy-bean silage has a bad effect on the quality of the milk, butter, and cheese.

"Soon after we began feeding soy-bean silage to our dairy herd, complaints were made by the university creamery, where the cream separated at the dairy barn is hauled, that this had a very objectionable flavor; it was found that this flavor would contaminate a large quantity of cream, and that the butter made from the cream would, likewise, possess the same flavor and render it unfit for a discriminating trade. It was also found that the curd made from soy-bean-silage milk showed a gassy fermentation, and possessed a sweetish, disagreeable odor when pressed between the fingers.

"Milk produced when soy-bean silage was fed was submitted to three judges for criticism, with a number of other samples of milk of faultless flavor. Without an exception the soy-bean-silage milk was discovĕred and was pronounced of poor flavor by all the judges. We are confident therefore that the milk produced on soy-bean silage could not be retailed without causing considerable annoyance to the dairymen on this account.

"In our system of feeding silage, this is always fed *after* milking time; the cows are kept in a modern, sanitary, well-ventilated, and lighted stable; the mangers are always cleaned out before the cows are milked, and the milk is removed from the stable air as soon as drawn, and weighed. On basis of our experience with soy-bean silage, we do not believe therefore that a satisfactory grade of milk or other dairy products can be made when this silage is fed to the cows."

It is noted that breeding ewes became accustomed to soy-bean silage after several days and, in the opinion of the shepherd, improved in condition during a feeding period of 2 weeks. The objections made to soy-bean silage were not found to apply to the mixed silage containing only a small proportion of soy beans. "According to our present experience we may therefore consider this silage mixture an improvement on corn silage, in so far as it furnishes a succulent, palatable feed, containing a

somewhat larger proportion of nitrogenous food materials than is found in pure corn silage."

The university dairy herd, 1903–4, G. C. HUMPHREY and F. W. WOLL (*Wisconsin Sta. Rpt. 1904, pp. 75–111, pls. 2, figs. 15*).—This presentation and discussion of herd records is in continuation of Bulletin 102 of the station (E. S. R., 15, p. 502). Rations having somewhat narrower nutritive ratios than formerly were fed. The herd comprised 38 cows, representing Jersey, Guernsey, Holstein, Shorthorn, Red Polled, and Brown Swiss breeds. Descriptions and illustrations are given of the 15 cows added to the herd during the year. Data for the food consumption and production of 21 cows which have completed a year's record since the previous report are tabulated and discussed from several standpoints.

The largest yield of butter fat, 492.97 lbs., was made by a grade Red Polled cow. The average production of the 21 cows for the year was 7,913 lbs. of milk and 332.33 lbs. of butter fat, equivalent to 387 lbs. of butter. The average fat content of the milk was 4.2 per cent. As compared with previous years, the herd as a whole showed an improvement of about 8 per cent in the production of milk and butter. Only 9 cows, however, had previous records, and these showed an increased yield of about 5 per cent. The improvement is attributed in part to the age of the cows and in part to the system of feeding and management.

The average production of 5 cows of each of 4 breeds was as follows: Jersey, 6,422.1 lbs. of milk and 328.5 lbs. of fat; Guernsey, 5,614.7 lbs. of milk and 289.82 lbs. of fat; Holstein, 10,753.2 lbs. of milk and 368.6 lbs. of fat; and Shorthorn, 8,119 lbs. of milk and 310.3 lbs. of fat.

A further comparison was made of the extreme dairy type, the large dairy type, and the dual purpose type of cows described in previous publications of the station. Seven cows of the extreme dairy type produced on an average 6,870.8 lbs. of milk and 313.6 lbs. of fat, at a net profit of $46.43; 8 cows of the large dairy type, 8,230.8 lbs. of milk and 342.3 lbs. of fat, at a profit of $45.11; and 6 cows of the dual purpose type, 8,871.2 lbs. of milk and 340.7 lbs. of fat, at a profit of $54.19.

From data concerning the age and weight of cows in relation to the fat content of their milk it is concluded that, normally, cows above 5 years of age increase gradually in weight to their ninth or tenth year, while the fat content of the milk decreases about 0.1 per cent each year.

Analyses are given of the feeding stuffs used. The average daily ration consumed contained 22.65 lbs. of dry matter, 2.19 lbs. of digestible protein, 13.20 lbs. of digestible carbohydrates and fat and had a nutritive ratio of 1:6. The average daily production of the cows was 20.58 lbs. of milk and 0.908 lb. of fat. In 1902–3, 12 cows were fed rations having a nutritive ratio averaging 1:7.5, while in 1903–4 the ratio for the same cows averaged 1:6.2. An improvement of 0.26 per cent was observed in the average fat content of the milk, which is believed to be due to the increased amount of digestible protein fed. As this view is contrary to that generally held the experiments are to be repeated.

Official tests of dairy cows, 1903–4, F. W. WOLL (*Wisconsin Sta. Rpt. 1904, pp. 112–142, figs. 13*).—During the year 256 pure-bred cows owned by 38 breeders were tested by the station. The tests, aggregating 283, varied in length from 7 to 60 days and are reported in detail, illustrations being given of many of the best cows. Tests made previous to the present year and reported from time to time were summarized in Bulletin 107 of the station (E. S. R., 15, p. 1000). The total number of tests made by the station since 1886 is 1,314, of which 983 were of Holstein cows, 150 of Guernsey, 104 of Jersey, 34 of Red Polled, 11 of Shorthorn, 9 of Brown Swiss, and 23 of grade cows.

The effect of different stable temperatures upon the milk yield of dairy cows, W. B. RICHARDS and E. L. JORDAN (*Wisconsin Sta. Rpt. 1904, pp. 143–148*).—In two trials made with 12 cows and two with 6 cows in different years a stable tem-

perature of about 55° F. was compared with a temperature of about 45°. Notes are given on the manner in which uniform temperatures were secured and on the efficiency of the ventilation system of the university dairy barn.

In three trials high temperature periods of two weeks each showed an increased yield of milk of 78.8, 117, and 3.5 lbs., respectively. In the fourth trial a difference of 88.85 lbs. of milk was in favor of the lower temperature, and in the third trial a difference of 1.08 lbs. of fat was also in favor of the lower temperature. Two other trials in which conditions other than temperature were not uniform are briefly reported. An average of the results of all the trials was in favor of the higher temperature.

Causes of variation in the weight of dairy cows, F. H. KNOBEL (*Wisconsin Sta. Rpt. 1904, pp. 149–154*).—A study was made of the extent and causes of the variations in the live weight of 6 cows kept under normal conditions for a period of 4 months. After deducting for a general average increase in the weight of the cows during the period, the range of variation between the maximum and minimum was found to be 30¼ lbs.

A possible variation in weight due to all causes is placed at 42.47 lbs., which is divided among the causes of variation as follows: Water drunk, 22.4 lbs., or 52.75 per cent; heat and repair material, 10 lbs., or 23.52 per cent; solid excrement, 6.37 lbs., or 15 per cent; liquid excrement, 2 lbs., or 4.7 per cent; and milk secretion, 1.7 lbs., or 4.03 per cent.

Protecting cows from flies, C. L. BEACH and A. B. CLARK (*Connecticut Storrs Sta. Bul. 32, pp. 14, fig. 1*).—The stable fly and the horn fly are briefly described and remedies which have been suggested for relieving stock from their annoyance are given.

One of the proprietary remedies or ointments put upon the market as a "fly remover" has been tested at the station for 2 years. Each year the dairy herd was divided into two groups, care being taken to have the groups similar as regards age, breed, stage of lactation, and productiveness. The cows in each group were treated daily in alternating periods with the remedy. The average results for the first year, in which one group was sprayed the first, third, and fifth weeks, and the other group, the second and fourth weeks showed no gain in milk or fat production from spraying.

During the second year the periods were lengthened to 2 weeks but reduced in number to 3. Only the second week of each period was used for comparison in order to eliminate the effects of the spraying extending over from one week to the next. The remedy was efficient in removing the flies but exerted no influence on the milk production. On several occasions a peculiar odor in the milk was attributed to the ointment. It is concluded therefore that the annoyance of cows by flies seems to be overestimated, and that while certain proprietary remedies may protect the animals to a greater or less extent, their use has little or no effect on milk production.

Department of dairying, F. L. KENT (*Oregon Sta. Rpt. 1903, pp. 29–33*).—A test was made of a proprietary remedy for repelling flies from cows. Four cows treated during August and September gained 265 lbs. in weight, while 4 cows not treated gained only 212 lbs. The shrinkage in the production of milk of 2 cows which were treated was 10 per cent less than that of 2 cows not treated.

Data are given for a feeding experiment in which 9 cows were divided into 3 lots, one of which was fed silage; one, silage and hay; and one, hay, grain being fed in addition in each instance. The results show no great differences in the 3 rations.

Animal husbandry, J. WITHYCOMBE (*Oregon Sta. Rpt. 1904, pp. 26–28*).—A brief account of an experiment in which a ration consisting of corn silage and a small quantity of ground oats was fed to 1 cow from January 1 to April 30 to determine whether a ration containing approximately the same quantity of protein, but composed entirely of grass silage could be used for wintering dairy cattle. The conclu-

sion is drawn that cattle can be wintered successfully on grass silage, and that cows can be expected to yield a reasonable amount of milk when fed exclusively on this material.

Feeding silage to cows, A. L. KNISELY (*Oregon Sta. Rpt. 1903, pp. 44, 45*).—Analyses of composite samples of milk from cows fed silage and from cows fed hay are reported. No greater variations than usual were observed in the milk from cows fed silage. Milk from cows fed silage had a more pronounced odor than milk from cows fed hay, which was considered the only distinct feature noticeable.

Bacterial analysis of milk from silage-fed cows, E. F. PERNOT (*Oregon Sta. Rpt. 1903, pp. 54–56*).—Cows were fed ordinary corn silage and silage which had been heated by steam when placed in the silo to preserve it, and bacteriological examinations were made of the milk which was obtained with aseptic precautions. The results are briefly summarized as regards the total number of acid and nonacid producing organisms found. Many samples were obtained free from bacteria.

Dairying on the plains, J. E. PAYNE (*Colorado Sta. Bul. 88, pp. 19–24*).—This is a brief popular account of dairying on the plains of Colorado. Notes are also given on the construction and use of pit silos. It is stated that, as a rule, the returns from dairying on the plains are comparatively small.

Yield and composition of sows' milk, L. R. DAVIES (*Wisconsin Sta. Rpt. 1904, pp. 41–47*).—This is a synopsis by A. S. Alexander of experiments conducted to determine the quantity and composition of milk produced by a sow, the amount of food necessary for 100 lbs. gain in the weight of suckling pigs, the relative gains in weight made during the daytime and night, and the influence of temperature on live weight.

The conclusions drawn are as follows: "(1) The milk production of sows varies considerably according to breed, temperament, and feeding, and is influenced by these factors to the same degree as with cows; (2) pigs while young can be fed more economically per 100 lbs. gain in live weight than at any other time; (3) suckling pigs make their chief gain in weight during the nighttime, those in this experiment showing 70.89 per cent as the proportion in gain made at that time; (4) marked variations in temperature affect the weight of pigs favorably or unfavorably while slight variations have no appreciable effect."

On the daily yield and composition of milk from ewes of various breeds, J. G. FULLER and F. KLEINHEINZ (*Wisconsin Sta. Rpt. 1904, pp. 48–50*).—The yield of milk was determined by weighing the ewe before and after suckling her lamb and also by milking by hand, the latter method failing to secure half of the milk. Data for 14 pure-bred and grade ewes are reported, the average results by breeds being summarized in the following table:

Average yield and composition of ewes' milk.[a]

Breed.	Number of ewes.	Yield of milk.		Composition of milk.			
		By suckling.	By milking.	Specific gravity.	Fat.	Solids not fat.	Total solids.
		Lbs.	*Lbs.*		*P. ct.*	*P. ct.*	*P. ct.*
Oxford	2	3.12	1.4	1.0378	7.65	10.993	18.642
Southdown	2	1.85	.925	1.0378	8.4	11.117	19.517
Dorset	2	4.28	1.50	1.0378	7.2	10.877	18.077
Shropshire	3	2.5	.543	1.0385	5.88	10.821	16.718
Merino	3	2.33	.716	1.0385	6.00	10.825	16.825
Montana	2	2.78	1.05	1.0388	7.15	11 117	18.267
Average		2.75	.966	1.0382	6.89	10.939	17.831

[a] Changes have been made in this table as it originally appeared in the Wisconsin Report on the basis of correspondence with the station—ED.

The transformation of food fat into milk fat, S. GOGITIDSE (*Ztschr. Biol., 46 (1905), No. 3, pp. 403–420*).—Japanese wax was fed to a goat without influencing in

any way the iodin number of the milk fat. Linseed oil was saponified with sodium hydroxid, and the resulting soap combined with bread was given to goats in quantities of 10 to 35 gm. daily. In one instance the iodin number of the milk fat was increased from about 32 to over 41 and in another instance from 35 to 55. There was no increase in the free acids. Saponified stearic acid fed to a goat caused a decrease in the iodin number from 45 to 28. Spermaceti was also used in experiments with goats.

The author concludes from his experiments with animals (see also E. S. R., 16, p. 299) that food fat in a considerable quantity and without changes in chemical properties passes over into the milk fat, part directly and part through the deposits of fat in the animal body, and that the milk glands are capable of utilizing soaps in the formation of milk fat. Linseed oil and hemp oil given to 3 nursing women caused considerable variations in the iodin numbers of the milk fat. A bibliography is appended.

Iron content of human milk, Camerer and Söldner (*Ztschr. Biol., 46 (1905), No. 3, p. 371*).—From 845 cc. of human milk 2.876 gm. of ash was obtained, of which 1.97 mg. was Fe_2O_3. In a second instance 3.765 gm. of ash containing 1.89 mg. of Fe_2O_3 was obtained from 1.5 liters of milk. In the first case, therefore, 100 cc. of milk contained 0.21 mg. of Fe_2O_3, and in the second 0.13 mg.; and 100 gm. of ash contained in the two instances, respectively, 66.4 and 50.2 mg. of the ferric oxid.

Disappearance of bacteria artificially introduced into cows' udders, H. L. Russell and E. G. Hastings (*Wisconsin Sta. Rpt. 1904, pp. 164–168*).—The experiments were made with *Bacillus acidi lactici*, an acid-producing liquefying bacillus isolated from Cheddar cheese, *B. prodigiosus*, and a yellow liquefying coccus isolated from foremilk. Agar cultures of these organisms were transferred to distilled water or normal salt solutions and introduced into the udder through a milking tube.

The results for the experiment, which were made with several animals at different times, are tabulated and furnish, according to the authors, no evidence of the growth of any of the introduced species within the udder. In nearly every instance the milk became abnormal and occasionally the udder became inflamed and tense, showing the production of a temporary garget.

Can fresh sterile milk be obtained? V. Willem and A. Minne (*Rev. Gén. Lait, 4 (1904), No. 6, pp. 121–130; 4 (1905), No. 7, pp. 145–154*).—In 4 series of experiments with 3 cows, 38 samples of milk were obtained with great precautions to avoid contamination in milking. Bacteriological examinations of these samples showed the presence of 17 different forms of micro-organisms all of which were believed to have gained access to the milk from other sources than the interior of the udder with the exception of the streptococcus of mammitis.

So far as these experiments go, the authors believe that they indicate that the milk in the healthy udder exists in a sterile condition, and becomes contaminated in milking in the teat and at the orifice of the duct. It is noted that these results support the earlier views advanced by Pasteur, Duclaux, and others rather than agree with the recent investigations of Ward, Boekhout and de Vries, von Freudenreich, and others, but it is distinctly stated that they are published only as a preliminary note on investigations which are being continued. References are given to the recent literature of this subject.

Effect of short periods of exposure to heat on tubercle bacilli in milk, H. L. Russell and E. G. Hastings (*Wisconsin Sta. Rpt. 1904, pp. 178–192*).—Milk was inoculated with cultures of tubercle bacilli of human and bovine origin and subjected in sealed tubes to different degrees of heat for varying lengths of time, the main object, however, being to determine the time required to destroy the bacilli at 160° F. with a view to applying the results to the continuous pasteurization of milk.

Five series of experiments are detailed, in each of which the virulence of the milk was determined by intraperitoneal inoculation of guinea pigs. The conclusion is

drawn that "a temperature of 160° F. or above, for a period of one minute, suffices to destroy the virulence of bovine tubercle cultures, so that the disease is not produced in experimental animals, like guinea pigs, inoculated with cultures ranging from 2 to 5 mg."

It is noted, however, that these laboratory experiments have been conducted under conditions more carefully controlled than is possible in commercial practice, and while the results are believed to lay a proper foundation for a safe and efficient treatment of milk, it is suggested that variations in the conditions of exposure, and also variations in the organism itself, must be studied before this new limit for the efficient pasteurization of milk in machines of the continuous-flow type can be accepted unreservedly.

A graphic method of demonstrating the action of acid-producing bacteria on casein, E. G. Hastings (*Wisconsin Sta. Rpt. 1904, pp. 169–171, pl. 1*).—The culture medium is prepared by adding 10 per cent of sterile skim milk to ordinary nutrient agar. Plates are inoculated by making a single streak across the surface. Paracasein monolactate, formed by the action of the acid produced, is dissolved out by the dilute salt solution of the medium leaving a transparent zone. A similar effect may be produced by means of a thread moistened with lactic acid. A more opaque zone immediately adjacent to the line of growth is due to the presence of the dilactate, which is insoluble in the salt solution. Previous references to this method have been made (E. S. R., 14, p. 533; 16, p. 597).

Some bacteriological investigations in dairy practice, H. Weigmann and T. Gruber (*Milchw. Zentbl., 1 (1905), No. 1, pp. 3–6*).—A peptonizing and rennet and trypsin-producing micrococcus was isolated from cheesy milk or milk which was found to curdle without the usual amount of acid. Large quantities of yeast and also *Oïdium lactis* were isolated from butter showing red spots. Salting the butter was found to lessen the development of the coloration.

Clabbered milk, causing digestive disturbances in consumers, showed the presence of large numbers of *Bacillus coli immobilis* and also yeasts and some lactic-acid bacteria. *Bacillus lactis aerogenes* and other bacteria were isolated from butter showing marked gas formation during storage. It was believed that these micro-organisms gained access to the butter through the pure cultures in powder form used in the ripening of the cream. Mention is also made of the isolation of a new species of bacteria from slimy milk.

Weather effects on the quality of milk (*Mark Lane Express Agr. Jour., 92 (1905), No. 3825, p. 76*).—This is a brief statement concerning a report made by a committee of the Essex County council consisting of B. Dyer, T. S. Dymond, and J. C. Thresh, which was appointed to investigate the effect of dry and wet weather upon the quality of milk and the use of preservatives in dairy products.

Over 1,100 samples of milk were examined during the last 3 years and comparisons made with the rainfall records during the same period. While great variations were observed in different years and in different periods of the same year, the results were considered as affording no evidence whatever that excessively dry or excessively wet weather produced any influence upon the quality of mixed milk.

The standard of the Board of Agriculture, viz, 3 per cent of fat and 8.5 per cent of solids-not-fat, is considered neither unfair nor onerous to the farmer. The use of preservatives in milk is condemned.

Biological and biochemical studies of milk, C. J. Koning (*Rev. Gén. Lait, 4 (1904), Nos. 1, pp. 9–16; 2, pp. 31–38; 3, pp. 55–64; 4, pp. 76–85; 5, pp. 104–114; 6, pp. 131–138; 4 (1905), No. 7, pp. 155–163*).—A brief account is given of milk secretion and the literature concerning the germicidal properties of milk is reviewed, following which the author reports 30 experiments on the latter subject and draws from them a number of conclusions, including the following:

Fresh milk contains toxic substances, probably of hematogenous origin. For a

certain period following milking the bacteria in the milk decrease in numbers. This is more clearly shown in milk poor in bacteria than in milk containing large numbers. The bactericidal substances are more active at 37° C. than at lower temperatures and are destroyed by cooking. Certain species of bacteria and molds are destroyed by the toxic substances. Colostrum possesses a vigorous toxic influence upon the coli bacillus. The bacterial flora of market milk furnishes an indication of its freshness. The individuality of the cow has an influence upon the richness of the milk in germicidal substances.

The second part of this article is a discussion of the changes taking place in the germ content of milk during the process of decomposition.

The influence of formalin on milk and rennet, E. LÖWENSTEIN (*Ztschr. Hyg. u. Infectionskrank., 48 (1904), No. 2, pp. 239–246*).—The results of the experimental work reported show, according to the author, that formaldehyde acts upon milk lessening its coagulability with rennet, the extent of the change produced depending, in the first place, upon the length of time during which the formaldehyde acts upon the milk and, in the second place, upon the amount of the preservative present.

This effect is brought about even by the small amounts of formaldehyde ordinarily used as a disinfectant. While formaldehyde in the gaseous state destroys the power of dry rennet extracts, solutions of formaldehyde do not act to such an extent upon rennet in solution.

Pathologically altered milk, C. SCHNORF (*Schweiz. Arch. Tierh., 46 (1904), No. 6, pp. 249–281*).—A study was made of the physical and chemical changes which milk undergoes as a result of certain pathological conditions, such as nymphomania, estrum, ovariotomy, tuberculosis, inflammation of the udder, diabetes, emaciation, and other diseases. The milk obtained from cows thus affected was tested by means of the refractometer, cryoscopic and electrical apparatus.

It is concluded from this study that the preservation of milk in glass flasks for 48 hours at a temperature of 15° C. had no effect upon its electrical conductivity. The same may be said for the process of coagulation until this process has reached an advanced stage. The conductive power of the milk for electricity remains quite constant at different periods during health, but differs somewhat in different animals. Estrum was found to have no influence upon the electrical conductivity of milk but lowered the freezing point. The refraction index of milk from cattle suffering from different diseases appeared to be unaltered. The freezing point, however, was somewhat elevated.

The care and handling of milk, C. E. MARSHALL, W. R. WRIGHT, and J. MICHELS (*Michigan Sta. Bul. 221, pp. 53–74, figs. 12*).—This is a popular bulletin made up of 2 parts, the first by Marshall and Wright, dealing with the transmission of diseases by means of milk, influence of food upon milk production, contaminations of milk, aerating, cooling, and straining milk, sanitation in the stable and dairy, and other topics; and the second part, by Michels, dealing with practical conditions for the production of milk, including a discussion of dairy utensils, stables, barnyards, etc.

Clean milk, W. J. FRASER (*Illinois Sta. Circ. 78, pp. 14, figs. 7*).—Brief popular notes are given on this subject and on standard milk.

Discussion on the control of the milk supply, G. NEWMAN ET AL. (*British Med. Jour., 1904, No. 2278, pp. 421–429*).—The prevention of milk-borne diseases and the improvement of milk supplies are treated in a comprehensive manner by Dr. Newman in this address which was delivered before the section of State medicine of the British Medical Association at its seventy-second annual meeting in July, 1904.

Considerable information is presented on the production, conveyance, and sale of milk in England, the quality of the milk, and on the control exercised over milk supplies; the best working dairy farm known to the author in that country is briefly described; the supplying of modified milk for infants is discussed; and suggestions are made for the improvement of existing conditions.

In regard to the control of the milk supply this country is considered in advance of Great Britain, particularly in the following respects: "The increasing use of bottled fresh milk; the diminution in the practice of pasteurization, the Americans having learned that pure milk is preferable to pasteurized milk; the enforcement of the dairy laws; the beneficial results of thorough inspection; and the value of the careful collection of facts respecting milk." The discussion of this subject was further participated in by H. de Rothschild and others.

Nutritive value of cows' milk sterilized at 108° C. for artificial feeding, G. Variot (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 23, pp. 1002, 1003*).—During 12 years the author has superintended the artificial feeding of 3,000 infants, using for this purpose milk sterilized in bottles at 108° C. and has observed no case of infantile scurvy resulting from such practice. The assimilability of the milk was not believed to be influenced in any appreciable manner by the destruction of the enzyms, the slight alteration of the lactose, the doubtful precipitation of the citrate of lime, or the changes in the lecithin due to heating.

Combating infant mortality by public means and private charities by supplying pure milk for infants with special reference to the situation in Hamburg, von Ohlen (*Ztschr. Hyg. u. Infectionskrank., 49* (*1905*), *No. 2, pp. 199–281*).—The efforts being made to secure pure milk for infant feeding in different places in Germany, United States, England, France, Norway, and Sweden are described at considerable length and some general conclusions are drawn as to the best methods to be employed for this purpose.

Statistical and ethnographical contributions to the question of the relation between infant feeding and pulmonary tuberculosis, B. Heymann (*Ztschr. Hyg. u. Infectionskrank., 48* (*1904*), *No. 1, pp. 45–64*).—The author presents and discusses statistical data on phthisis in various countries, especially Japan, Turkey, and Greenland, and concludes that cows' milk as a food for infants can play only a very small part in the spread of tuberculosis.

The relation of infant feeding to the origin of pulmonary tuberculosis, A. Speck (*Ztschr. Hyg. u. Infectionskrank., 48* (*1904*), *No. 1, pp. 27–44*).—From replies to circular letters and by other means, data were collected concerning the feeding during the first 3 months of life of tuberculous cases in public hospitals and private sanitaria in Germany, Austria, and other countries.

Of 5,770 cases, it was ascertained that 3,455 had been breast fed, 694 fed on cows' milk, 7 on goats' milk, 276 on mixed milk, and 35 on milk substitutes, leaving 1,303 cases with incomplete data. Data for a limited number of cases in private practice are included, as are also data collected by other investigators. On the whole, 73 per cent of the tuberculous cases had been breast fed and 27 per cent artificially fed. It is estimated that of the whole population less than 50 per cent are breast fed, which would indicate a relatively greater percentage of tuberculous cases among breast fed than among artificially fed infants.

It is, therefore, concluded that cows' milk is to be looked upon as at least an exceedingly unimportant source of pulmonary tuberculosis in man.

Changes in butter, M. Henseval (*Rev. Gén. Lait, 3* (*1904*), *No. 23, pp. 535–539*).—The causes of the changes in butter are briefly discussed and methods of analysis suitable for the detection of these changes are briefly outlined. Fresh butter and samples 2 and 3 months old were analyzed and also subjected to bacteriological examinations, the results of which are reported in tabular form without comment.

Investigations of Polenske's "new butter number," A. Hesse (*Milchw. Zentbl., 1* (*1905*), *No. 1, pp. 13–20*).—The results of a considerable number of determinations failed to show such a definite relation between the Reichert-Meissl number and the "new butter number" as found by Polenske (E. S. R., 15, p. 850). For instance, Reichert-Meissl numbers of 26 and 26.2 showed corresponding "new butter numbers" of 2 and 2.7.

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The effect of the feeding of cows upon the "new butter number" of the butter fat was studied during a period of 3 months, greater variations being observed than in the case of the Reichert-Meissl numbers. It is believed that further investigations are necessary in order to determine the maximum "new butter number" for pure butter fat which would be necessary for drawing conclusions as to the adulteration of butter with cocoanut oil.

The quality of cheese as affected by rape and other green forage plants fed to dairy cows, U. S. BAER and W. L. CARLYLE (*Wisconsin Sta. Bul. 115, pp. 16, figs. 2*).—During 1900 it was observed that rape was specially valuable as a soiling crop for dairy cows so far as yield of milk was concerned but that it seemed to flavor the milk worse than any other feeding stuff used.

During 1901 the effort was made to devise some method of feeding this crop so that the milk would not be injured for cheese making. The influence of the stage of maturity of the crop at the time of feeding and the effect of withholding rape from cows for several hours before milking were especially tested. During 1902 the studies included clover, cabbage, and corn as soiling crops in addition to rape, and tests were also made to determine the effect of cold curing of cheese upon the objectionable flavors.

The following general conclusions are drawn:

"Rape, if fed even in limited quantities to milking cows, is likely to impart to the milk a taint which will be imparted to the cheese, and can not be eliminated by any art known to the cheese maker at the present time.

"Cheese made from rape-fed milk presents both offensive odors and tastes.

"The longer the period of feeding extended, the better the quality of the cheese produced with reference to flavor, indicating that the systems of the cows producing the milk tended to conform to the peculiarities of the feed and thus eliminate, at least a portion, of the noxious flavors.

"The flavor of the product from the morning's milk where the feeding was done immediately after milking was of a decidedly improved quality over that from the evening's milk where the feeding was done shortly before milking.

"The body, texture, color, and general make up of the cheese are not affected in any manner by the feeding of rape to milch cows for cheese-making purposes.

"When cabbage was fed to milch cows disagreeable flavors were always imparted to the cheese, and these bad flavors were intensified as the ripening advanced.

"Milk from cows fed exclusively upon green clover produced cheese having a low, flat flavor which finally became sharp and repugnant.

"Green forage corn when fed to cows produced an excellent quality of milk for cheese. The cheese were of fine texture, with clean, high flavor at all stages of the ripening."

Relation of flavor development in cold-cured Cheddar cheese to bacterial life in same, H. L. RUSSELL and E. G. HASTINGS (*Wisconsin Sta. Rpt. 1904, pp. 155–163*).—Determinations were made of the number of bacteria in cheese partly ripened in cold storage at 40° F. and then held at 60° for varying periods. In all the cheeses examined there was a decline in the bacterial content which diminution was invariably more rapid than that in control samples kept continuously at 40°.

There was no evidence of any actual development of bacteria. An increased flavor in cheese removed from cold storage to the higher temperature was not apparent until after about 2 weeks, and then the marked development of flavor occurred simultaneously with a sharp diminution in content of acid bacteria, which fact is considered inconsistent with the hypothesis that the growth of such organisms is directly related to the production of flavor.

"Whatever agents are concerned in this process seem to be affected by the temperature in a profound way. As to the exact nature of these agents no definite answer as yet seems possible. So far as inferences can be drawn from these studies

it would appear more probable to consider that the immediate factors concerned in flavor production are likely to belong to certain chemical compounds of an unstable character that are liable to undergo chemical transformations with an increase in temperature; and that the real substances capable of producing these desirable flavors are easily affected decomposition products.

"As to the nature of the exciting agents capable of inaugurating these complex chemical transformations, little or nothing definite is known. It is not improbable that they may be bacteria; neither is it impossible that soluble enzyms may also function in their capacity as fermentative agents, setting up the initial changes which ultimately result in the production of the proper and essential flavor-producing compounds."

VETERINARY SCIENCE AND PRACTICE.

Recent developments in medicine, JESS (*Berlin. Tierärztl. Wchnschr., 1904, No. 39, pp. 649–654, figs. 2*).—The value of radium in veterinary practice is discussed, and notes are given on the influence of X-rays and other forms of light rays upon pathogenic bacteria. According to certain investigations on the action of radium, it appears that this substance has the power of checking the development of pathogenic bacteria or of destroying them entirely.

Notes are also given on the recent investigations with regard to local anesthesia of the spinal column, and also on adrenalin and other related compounds, as well as on the recent discoveries relating to ultra-microscopic investigations by means of light rays perpendicular to the line of vision.

Text-book of general pathology for veterinarians and students, T. KITT (*Lehrbuch der Allgemeinen Pathologie für Tierärzte und Studierende. Stuttgart: Ferdinand Enke, 1904, pp. VIII+436, pls. 4, figs. 119*).—The need was felt for a brief and comprehensive text-book on the subject of general pathology for veterinarians. The author, therefore, prepared the present volume to supply this demand in Germany. The material is presented in as concise a form as is consistent with clearness and the numerous illustrations assist in an understanding of the text.

Certain problems of immunity, A. WOLFF (*Berlin. Klin. Wchnschr., 41 (1904), No. 42, pp. 1105–1110*).—A critical discussion is presented of endotoxins and toxins, the relation of endotoxins to the production of immunity, and other questions related to the subject of immunity.

Morphological changes in red blood corpuscles produced by a specific hemolytic blood serum rendered inactive, R. RÖSSLE (*München. Med. Wchnschr., 51 (1904), No. 42, pp. 1865–1869*).—Serum was taken from a rabbit which had been treated with intraperitoneal injections of beef blood. The serum was rendered inactive by heating to a temperature of 53° C., after which it was mixed with washed blood corpuscles from cattle in the proportion of 2½ to 8 and allowed to digest under these conditions for a period of 2 hours.

Under the influence of high temperatures, considerable differences appear between treated and nontreated red blood corpuscles. The author found that blood corpuscles which had been treated in this manner were more resistant to injurious influences than untreated blood corpuscles.

The toxicity of red blood corpuscles in different species of animals for rabbits, F. BATTELLI (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 22, pp. 1041–1043*).—During the author's experiments on this subject it was found that the contents of the red blood corpuscles of dogs, cats, and cattle when injected into the veins of rabbits are not toxic for these animals and the serum of the rabbit does not exercise a hemolytic effect on the red blood corpuscles. The contents of the red blood corpuscles of pigs, sheep, and rats, however, is toxic for rabbits, and they are destroyed by the rabbit serum. The red blood corpuscles of pigs possess especially high toxic power toward rabbits.

The toxicity of red blood corpuscles in immunized animals, F. BATTELLI (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 24, pp. 17–19*).—In these experiments rabbits were immunized against the action of the red blood corpuscles of cattle and dogs. The immunization was brought about by means of intraperitoneal injections of washed blood corpuscles. It was found that in immunized rabbits, the blood corpuscles or the stroma of the blood against which the animal is immunized produce agglutination with great rapidity when injected into the veins. The blood stroma appears to cause a pronounced fall in the blood pressure and brings about the death of the animal by obliteration of the branches of the pulmonary artery. The extract of the blood corpuscles from which the stroma is removed does not produce any immediate effect. The stroma of the blood or the intact red blood corpuscles are inactive if the serum of the injected rabbit does not possess any agglutinating power toward blood stroma.

The comparative bactericidal power of lymph, blood serum, and pericardial fluid, F. BATTELLI and G. MIONI (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 11, pp. 490–492*).—During the authors' experiments it was found that in dogs the bactericidal power of the lymph is slightly inferior to that of the blood serum, while the bactericidal power of the pericardial fluid is nil or very weak. It appears that the bactericidal alexin is secreted both in the lymph and in the blood serum by the large mononuclear leucocytes.

A method of rearing animals immune to surra in tropical countries, BRAUER (*Berlin. Tierärztl. Wchnschr., 1904, No. 45, pp. 731–736*).—Attention is called to the great economic importance of surra and related diseases, especially in tropical countries, and to the necessity of devising some practical means of immunizing domestic animals against these diseases.

The author carried out a number of experiments on dogs and other domesticated animals during which it appeared that if animals are exposed from earliest life to infection from spontaneous cases of the disease they may acquire a natural immunity which protects them perfectly from subsequent infection. The desirability is suggested of a further series of experiments for the purpose of determining the length of time required by animals for the production of immunity, the influence of milk upon spontaneous cases of the disease as well as in cases due to artificial inoculation and other related topics.

Leukemia in animals, P. E. WEIL and A. CLERC (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 24, pp. 21, 22*).—A study was made of the nature of this disease, particularly in dogs, for the purpose of obtaining data regarding the pathological anatomy, etiology, and transmission of the disease.

Contagious ulcerative lymphangitis, C. H. JEWELL (*Amer. Vet. Rev., 28* (*1904*), *No. 1, pp. 34–37, figs. 2*).—The symptoms and course of this disease are described. It resembles farcy to some extent, but attacks the epidermis primarily and is, therefore, more properly a contagious dermatitis. The pathogenic organism of the disease is a species of cryptococcus. In advanced stages of the disease the animal may be affected over nearly the whole surface of the body. Treatment with iodin usually gives better results than the actual cautery. In cases where iodin was ineffective the author used a disinfectant containing corrosive sublimate, salicylic acid, and alcohol.

Note on the co-relation of several stock diseases occurring among animals in South Africa, A. EDINGTON (*Agr. Jour. Cape Good Hope, 25* (*1904*), *No. 2, pp. 139–152*).—A number of important diseases in South Africa appear to be peculiar to that country and not known elsewhere. So-called horse sickness is apparently closely related to Veld sickness in cattle. The symptoms and post-mortem conditions observed in cases of this disease are briefly discussed.

The disease known as heart water can be transmitted from goats to cattle, and appears to be similar in many respects to so-called Veld sickness of cattle. There is,

consequently, an apparent co-relation between these 3 diseases in horses, cattle, and goats.

Trypanosome diseases, R. KOCH (*Berlin. Tierärztl. Wchnschr., 1904, No. 45, pp. 736–739, fig. 1*).—Brief outlines are presented of the essential nature, symptoms, etiology, and treatment of trypanosomiasis of rats, tsetse-fly disease, surra, and related diseases in man and animals.

The development of hemogregarines and trypanosomes, E. BRUMPT (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 27, pp. 165–167*).—Brief notes are given on the developmental stages of various species belonging to these groups.

The trypanosoma of dourine and its inoculation into mice and rats, J. ROUGET (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 16, pp. 744, 745*).—The author had already found that the organisms of dourine when inoculated into white mice multiply rapidly until the death of the experimental animals, which occurs from the fifth to the eleventh day.

A further study was made of this matter, and the author believes as the result of his experiments that the coexistence of several distinct trypanosomiases in Algeria must be denied. It is believed that there is only one disease due to trypanosomes and that the variation and symptoms are due to the resisting power of different organisms and other varying conditions.

The natural immunity of Cynocephalidæ for trypanosomiases, A. LAVERAN (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 3, pp. 177–179*).—This family of primates has been noted as possessing a natural immunity for diseases caused by trypanosomes. It was found that in rats affected with surra, nagana, and mal de caderas the serum of species of Cynocephalidæ in small quantities was sufficient to cause the disappearance of trypanosomes in the blood for a number of hours.

A disease in Somali land known by the name Aino, probably identical with nagana of eastern Africa, E. BRUMPT (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 14, pp. 673–677*).—This disease was observed occurring spontaneously in camels and mules. The author also made experiments on dogs, zebras, and species of monkeys. The only tsetse fly observed in the Somali country was *Glossina longipennis*.

The author made a study of the blood parasites of this disease as well as the symptoms produced in animals and concludes that the disease was identical with nagana. In Abyssinia also the author made a study of the disease known there as horse plague or "fever." The course of the disease varies somewhat in different cases, but an examination of the blood and a study of the post-mortem pathology of the disease convinced the author that it is identical with nagana. Notes are given on the geographic distribution of the disease.

Lesions produced in the nerve fibrillæ by tetanus toxin, G. MARINESCO (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 25, pp. 62, 63*).—Considerable difference of opinion prevails at present among authors regarding the regularity and value of anatomical lesions found in animals or man dead of tetanus.

The lesions observed by the author are quite variable as to form, intensity, and localization. Nerve cells with black fibrillæ remain intact or are only slightly altered. The lesion varies in intensity according to the extent of granular disintegration and fragmentary fibrillæ. The author determined during his experiments and investigations that in the medulla oblongata of guinea pigs dead of tetanus there are quite pronounced lesions of the nerve fibrillæ and that these lesions are due in a large part to the action of the tetanus toxin.

Tetanus toxin, carmin, and betain, J. REHNS (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 15, pp. 692, 693*).—A careful biological and chemical study was made of these substances and mixtures of them.

Primary intestinal tuberculosis in children, N. RAW (*British Med. Jour., 1904, No. 2265, pp. 1245, 1246*).—Critical notes on tuberculosis in young children, together with an examination of the conditions surrounding infection in a large number of cases.

As a result of the author's studies it is concluded that while primary intestinal tuberculosis is extremely rare in children the disease may frequently be conveyed in infected milk. The tubercle bacilli readily pass through the intestinal wall leaving no visible lesions in the intestines. In the author's opinion this form of tuberculosis is not true human tuberculosis, but is bovine in origin and may extend to all parts of the body. The tubercle bacillus of bovine origin is considered more virulent for children than that of human origin.

A case of human tuberculosis transmitted to a cow, E. Huon (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 23, p. 1109*).—A description is given of a case in which human tuberculosis was apparently transmitted to a cow. The cow had been tested for tuberculin without reaction and was kept in isolated quarters without coming in contact with any other animal. The cow was cared for, however, by a man who subsequently died of tuberculosis and had the bad habit of spitting everywhere indiscriminately. After the death of the attendant the cow was found to be tuberculous, as shown by the tuberculin test.

Infectiousness of milk from tubercular cows, H. L. Russell and E. G. Hastings (*Wisconsin Sta. Rpt. 1904, pp. 172–177*).—The authors have collected data regarding the presence of tubercle bacilli in milk from tuberculous cattle. Attention is called to the various difficulties which are met with in the identification of tubercle bacilli in milk.

During the experiments undertaken by the authors, samples of milk from tuberculous cows were inoculated into guinea pigs. In a number of cases the inoculated guinea pigs died of septicemia or peritonitis. In only 1 case, however, or approximately 5 per cent, did a tuberculous infection take place. The authors argue that there is a potential as well as a present danger to be considered in this problem. It is recommended that all milk from tuberculous cows be pasteurized before using.

The latest observations and experiments on the transmission of bovine tuberculosis, D. A. Hughes (*Amer. Vet. Rev., 27* (*1904*), *No. 12, pp. 1154–1160*).—Short abstracts are presented of the more important literature relating to the means of transmission of bovine tuberculosis to man and of human tuberculosis to cattle.

Combating bovine tuberculosis, E. Thierry (*Jour. Agr. Prat., n. ser., 8* (*1904*), *No. 33, pp. 203, 204*).—A brief review is presented of recent methods suggested for the control of this disease, particular attention being devoted to the vaccination method of von Behring. The chief objection to this method as at present elaborated is the considerable period of time required for producing an effective immunity.

Tuberculosis in fowls, A. R. Ward (*California Sta. Bul. 161, pp. 13, figs. 4*).—Apparently attention was first called to the existence of tuberculosis in fowls on the Pacific Coast in 1900. The writer has observed the disease only in grown fowls. In most cases the liver is affected, and for this reason poultry men frequently call the disease liver complaint or spotted liver.

Notes are given on the symptoms and pathological appearance of the disease. Tuberculous growths are usually observed in the walls of the intestines and in the liver. This fact, in connection with the further fact that tuberculosis of the lungs is exceedingly rare in fowls, indicates that the tubercle bacilli enter the body of fowls with the food. The disease is apparently not spread by means of the egg, but more likely through the agency of droppings.

In controlling the disease the tuberculin test, as shown by trials with 21 fowls, can not be relied upon. The affected fowls should be killed, roosting houses and yards should be sprayed with a disinfectant as frequently as possible, and healthy young fowls should be kept away from diseased stock and from infected premises.

The agglutinability and the agglutinating power of liquid cultures of avian tubercle bacilli, J. Nicolas and P. Courmont (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 10, pp. 455, 456*).—In these experiments it was found that the cultures of avian tubercle bacilli were not agglutinated even by a serum which possesses a

high agglutinating power, and came from dogs which had been inoculated with cultures of tubercle bacilli obtained from birds.

It is not considered necessary, however, to conclude that there are differences of nature or origin in tubercle bacilli from the observation of variations in agglutinability. A culture of avian tubercle bacilli which is not agglutinable can not be used for serum diagnosis.

Pseudo-tuberculosis in sheep, J. A. Gilruth (*New Zealand Dept. Agr., Div. Vet. Sci. Bul. 1, pp. 24*).—This disease affects sheep, goats, guinea pigs, and rabbits, but cattle seem to be immune. The virus is greatly attenuated by passage through rabbits. The disease progresses from one lymph gland to another and ultimately affects the lungs with a course somewhat similar to that of tuberculosis.

The similarity in the pathogenic properties of the bacillus to those of the tubercle bacillus is shown in the general appearance of the nodules, the progression of the disease, and the invasion of the lungs. Brief notes are also given on the literature relating to this disease.

A systematic list of articles relating to tuberculosis, P. Bouchez (*Rev. Tuberculose, 11 (1904), No. 4, pp. 310–328*).—An elaborate list of books, memoirs, and periodical articles published during 1904 on the various phases of tuberculosis of animals and man.

Cadaveric hyperthermia in Texas fever, J. B. P. Bey (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 13, pp. 606–608*).—During the first few hours after death from Texas fever it was observed that the temperature of the carcasses of Egyptian cattle sometimes passed 44° C. Detailed notes are given on a number of such cases. It is hoped that further studies will make it possible to find a satisfactory explanation of this phenomenon, which is comparable with phenomena observed in cases of Asiatic cholera in man.

Cattle ticks and Texas fever, C. L. Willoughby (*Georgia Sta. Bul. 64, pp. 143–182, figs. 9*).—Texas fever is said to cause an annual loss in Georgia of between 3 and 5 per cent of the total valuation of cattle in the State. Attention is called to the susceptibility of tick-free native cattle and to the great losses which occur among such animals. The Government quarantine line is described and notes are given on the life history of the cattle tick, influences which affect ticks, methods of exterminating them, symptoms of Texas fever, treatment of the disease, immunity by various methods, and a historical statement of inoculation work done in southern States.

The author believes that the South is the best place for inoculating infested cattle, since they can be shipped south in winter and may thus become accustomed to the climate before inoculation. According to the author, Mr. B. W. Hunt was among the first investigators to work out a successful method for immunizing cattle against Texas fever. In 1886 Mr. Hunt observed that one attack of the disease conferred immunity and that on his own farm certain pastures were more dangerous to northern cattle than others. He therefore used these places as immunizing calf pastures and developed a method of immunizing young cattle without loss.

The author carried on a number of experiments in inoculating northern cattle during the years 1903 and 1904. Nearly all of these cattle were young, most of them from 5 to 10 months of age. The calves were inoculated with $1\frac{1}{2}$ to 2 cc. of the blood of recovered animals. During these experiments it was found that such blood does not always produce inoculation fever. No losses were suffered from inoculation when performed under proper conditions and the animals subsequently subjected to tick infestation successfully resisted the disease. From these experiments it is concluded that southern stock breeders can control Texas fever if they will make an intelligent use of the methods which have thus far been tested.

It is believed to be possible to disinfect pastures and keep them free from ticks; or if another method is preferred home raised or imported cattle may be immunized

without danger. It is concluded that the blood of young immune animals under 18 months of age is not reliable for immunizing cattle. The blood parasites of Texas fever may remain in the blood of an adult immune animal for more than 3 years.

With regard to the method of tick infestation it was found that, with native calves, it requires an infestation of from 100 to 150 ticks to produce a definite fever reaction. Apparently, therefore, if calves are infested at the rate of from 50 to 75 ticks every 2 weeks they may be gradually immunized without suffering much harm. It is recommended that calves on infested pastures should be watched so as to prevent their carrying more than 75 to 100 ticks at any time.

Dipping experiments, S. T. Amos (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 7, pp. 718, 719*).—Numerous dipping experiments were made with Demuth's dip and Laidlow's tobacco dip, for the purpose of testing the value of these dips in destroying ticks on cattle. The immediate effects of dipping were quite favorable, a large percentage of the ticks apparently being destroyed. Later, however, it was found that the small brown tick had suffered very little and the female ticks were laying fertile eggs.

The dips were again tested in a stronger solution, but when even twice the ordinary strength was used a large percentage of the ticks withstood the effects of the treatment. The dips themselves are regarded as objectionable on account of the irritating effects and their disagreeable odor.

Cattle scab, L. Van Es (*North Dakota Farmer, 5 (1904), No. 12, pp. 7–9, figs. 8*).—A description is presented of the scab mite which causes this disease and also of the symptoms as they usually present themselves. Cattle scab is quite prevalent in the western part of North Dakota, and dipping has become necessary to prevent the development of the disease. Detailed directions are given for the preparation of dipping vats or chutes for use among both large and small herds. The dip most generally recommended contains sulphur and lime, and should be applied at a temperature of 105 to 110° F.

Experience with the new milk fever treatment, O. L. Dobson (*Nebraska Farmer, 36 (1904), No. 36, p. 876*).—The author gives the history of a case of milk fever in which the air treatment was applied by means of a very simple apparatus. In the place of the usual glass or metallic tube the hollow portion of a turkey feather was used, and this was attached to an ordinary bicycle pump and the air forced in. Recovery took place without any complication.

Oxygen treatment in parturient apoplexy, F. R. Whipple (*Amer. Vet. Rev., 27 (1904), No. 12, pp. 1165, 1166*).—The author used the Schmidt treatment for this disease for 2 years. Considerable trouble was experienced, however, from complications which appeared in the form of inflammation or diminution of the milk yield. In about 50 per cent of the cases the yield of milk became so small as to render the animal unprofitable. Much better results have been obtained from the use of pure oxygen in treating milk fever. The udder is carefully disinfected before treatment. Clinical notes are given on 4 cases in which the animals rapidly recovered.

The influence of lactation on the resistance of the organism to pathogenic bacteria, Charrin and Vitry (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 3, pp. 229–231*).—As a rule the function of lactation has been considered as inducing a series of changes which render the organism more susceptible to infection with disease.

A considerable series of experiments were made on guinea pigs for the purpose of testing the influence of lactation on infection. It was found that lactation causes a number of physiological changes which, temporarily at least, reduce the resistant power of the organism to pathogenic bacteria. These changes consist partly in a variable degree of autointoxication and of increased sensibility toward toxins of various sorts.

Œsophagostomiasis, D. F. Luckey (*Missouri State Bd. Agr. Mo. Bul., 4 (1904), No. 4, pp. 5–12, fig. 1*).—During the past 2 years numerous reports have been received

from farmers indicating the loss of cattle from infestation with *Œsophagostoma inflatum*. Infestation of native herds appears in nearly all cases to have come from western cattle. A number of outbreaks of the disease were traced to this source.

The life history of the parasitic worm is not well known. The disease, however, is mildly contagious. In all cases where the parasite was found in the contents of the large intestines the embryonic stage of some worm was found in the mucous membrane of the intestine but was not definitely identified as the larva of *Œ. inflatum*. The disease is most prevalent among calves and yearlings and appears in its worst form in winter, or when the cattle are on dry feed. The symptoms are loss of condition, a progressive anemia accompanied usually with diarrhea in the later stages. The appetite remains good.

In treating the disease but little can be expected from the use of drugs. The author recommends, however, that the feed should be placed in clean troughs and racks and that the cattle should be watered from tanks. As a tonic it is recommended that cattle be fed a mixture containing 2 lbs. sulphate of iron and 1 lb. sulphate of copper with every 10 lbs. of salt given to the cattle.

Persian sheep and heart water, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 25* (*1904*), *No. 2, pp. 175–186, figs. 3*).—The Persian sheep bred in South Africa are readily susceptible to heart water. They recover from the disease, however, without serious illness, and thereafter possess a high degree of immunity. The virulence of infection is not noticeably influenced by passing through these sheep.

The breed is described in detail, and historical notes are given on its introduction and distribution. Persian sheep are hardy and mature early. On these accounts and on account of their resistance to heart water they have become a favorite breed in South Africa. The disease known as heart water is associated with *Amblyomma hebræum*, and notes are given on the life history of this tick.

The cause of the unusual resisting power of Persian sheep to heart water is not well understood, but appears to be inherent in the breed. Experiments were carried out which showed that crossbred Persian sheep were equally resistant to an infection sufficient to destroy goats or cattle within 24 hours.

Gid in sheep (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 5, pp. 294–296*).—The symptoms of this disease are briefly noted. In preventing the distribution of the tapeworm, which causes the disease, the author recommends that the heads of affected sheep be destroyed and that all dogs employed in the care or management of sheep be treated annually for worms.

Death of horses as a result of infection with tapeworms, GRAF (*Wchnschr. Tierheilk. u. Viehzucht, 48* (*1904*), *No. 2, pp. 661–663*).—Notes are given on the effect of infestation of horses with *Tænia mamillana*. This parasite appears in rare instances to cause death as a result of chronic inflammation of the intestines and anemia.

Calcium sulphid in the treatment of poll evil and fistulous withers, B. R. WILBUR (*Amer. Vet. Rev., 27* (*1904*), *No. 12, pp. 1134–1139*).—During the investigations reported in this paper 17 cases of poll evil and fistula were treated with calcium sulphid. This drug was given internally in doses of 2 drams 3 times daily. During the later stages of treatment as much as 2 oz. per day was given. The drug was also applied locally to the affected parts.

The use of calcium sulphid appeared to have no effect upon the pulse, respiration, or temperature of the treated animals, when given in moderate doses. Larger doses than 15 grains twice daily increase the discharge of pus and hinder the healing process, while such doses also disturb the temperature and pulse. Calcium sulphid applied locally increases the discharge of pus. Best results are obtained when the drug is used alone. Small doses appear to lessen the discharge and prevent the burrowing of the pus. Calcium sulphid may be best administered in a capsule.

The infectious nature of anemia of horses, H. VALLÉE and CARRÉ (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 4, pp. 331–333*).—The authors have made

a study of anemia in horses, with the result that the disease appears to be, in their opinion, of a contagious nature and readily transmissible. It is considered to be due to an organism belonging to the ultramicroscopic group. Pernicious anemia in man and anemia of dogs are therefore perhaps to be considered as true infectious diseases.

Infectious anemia of the horse, E. THIERRY (*Jour. Agr. Prat., n. ser., 8 (1904), No. 34, pp. 243, 244*).—A bacteriological study of this disease has thus far given only negative results. It is being studied more carefully and persistently, however, and it is hoped that as a result of this study better methods for combating the disease may be devised.

Tapeworms of dogs and health of lambs, H. GEORGE (*Jour. Agr. Prat., n. ser., 8 (1904), No. 17, pp. 561, 562*).—Notes are given on the life history of *Tænia marginata* and attention is called to the desirability of treating dogs which are allowed to run in sheep pastures in order to prevent the infestation of lambs with tapeworms.

Rabies in birds, A. MARIE (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 12, pp. 573–575*).—The existence of rabies in birds has long been known, together with the comparatively long period of incubation of these animals in the regular course of the disease.

The author's experiments were made on chickens, pigeons, canaries, geese, and ducks. It was found possible in adult birds to produce rabies by means of intracerebral inoculation but only rarely possible to transmit the disease by means of pieces of the cerebrum of inoculated birds. The cerebral method of inoculation was the only one in which success was had in transmitting the disease. Inoculation in the eye, peritoneum, and veins and scarification of the mucous membrane were without results. It appears that very young birds were less resistant to rabies than adult birds.

By a passage through the brain of birds, rabies virus is attenuated to such an extent that it is no longer capable of producing disease either in birds or mammals. It was found that inoculation with pieces of the brain of birds was capable of protecting mammals against intraocular inoculation with rabies.

Contagious epithelioma of pigeons and chickens, M. JULIUSBERG (*Deut. Med. Wchnschr., 30 (1904), No. 43, pp. 1576, 1577*).—As a result of the study of the course and symptoms of these diseases as well as the virus, it is found that the virus of pigeon pox may be filtered in the same manner as the virus of chicken pox.

The incubation period of both pigeon and chicken pox after inoculation with filtered virus is about twice as long as after direct inoculation with the substance of the tumors. It was found that repeated passage of the virus of pigeon pox through animals attenuated it to such an extent that it finally became quite nonvirulent. The addition of erythrosin in 1 per cent solution also destroyed the virus. None of the pure cultures of yeasts, cocci, or bacilli obtained from contagious epithelioma were found to be pathogenic for pigeons or chickens.

AGRICULTURAL ENGINEERING.

Irrigation department, J. S. BAKER (*Montana Sta. Rpt. 1903, pp. 69–98, figs. 3*).—Brief accounts are given of experiments made in tanks on the relation of soil moisture to yield of wheat and evaporation from soils and water surfaces; also of field studies of the duty of water for irrigation of alfalfa, wheat, and potatoes; measurements of the duty of water under different canals of the State in cooperation with this Office; and discharge records of the principal streams of the State in cooperation with the U. S. Geological Survey.

The best results were obtained in the tank experiments where water was applied at the rate of 300 lbs. to each pound of dry matter produced. The loss of moisture from the soil was much larger in case of the cropped soil than in case of the fallow soils. The average evaporation from a tank during the 6 months ended October 31,

1903, was 17.39 in., with a mean temperature of 62.9° F. and an elevation of 4,865 ft. above sea level.

Sources and cost of power for pumping irrigating water (*Irrig. News, 52 (1904), No. 24, p. 548*).—An abstract of a paper by H. A. Storrs read at the Irrigation Congress at El Paso, Texas, November, 1904. The paper discusses the relative cost and efficiency of hydro-electric power and power from coal, crude oil, and gasoline or kerosene, the actual cost of distilled and crude oil in California, and producer gas as fuel.

The author concludes "that where hydro-electric power is impracticable steam boilers and engines should be selected only for large plants and in localities where fuel, either coal or crude oil, is exceptionally cheap; that, for small plants, internal combustion engines should generally be used, wherever crude oil, distillate, gasoline or kerosene can be obtained at reasonable prices, and that the greatest economy may be expected where crude oil is used; that in the majority of cases, where fuel of some kind must be the source of power, the combination of gas engines with fuel gas producing plants should give the most satisfactory results."

Irrigation, H. S. Lawrence (*Dept. Land Records and Agr., Bombay Pres., Season and Crop Rpt. 1903–4, pp. 8–10, XLII–XLVII*).—Data are given regarding the irrigated area; details of irrigation from canals, wells, and tanks; and number of wells, tanks, and other sources of irrigation water in the Bombay Presidency, and amount of water furnished by them.

Meeting of the River Improvement and Drainage Association of California at San Francisco (*River Imp. and Drainage Assoc. California Bul. 3, pp. 22*).—This is a brief account of the meeting, January 5, 1905, of this association, which was organized May 23 and 24, 1904.

A contribution to the question of irrigation in Germany, P. Holdefleiss (*Deut. Landw. Presse, 32 (1905), No. 1, pp. 3, 4*).—This article describes a special form of apparatus for measuring evaporation and records the results of observations from June, 1903, to September, 1904, on evaporation from a water surface, from gypsum, and from sand and garden soil, as compared with the rainfall for the same period.

On certain phases of water rights in Switzerland, Italy, France, Austria-Hungary, and Baden, A. Aaström (*K. Jordbruksdept. [Sweden] Meddel. 11, 1904, pp. 104*).—The report deals with the legal questions concerning water rights in the countries named, the technical and economic phases having been discussed in the report of S. Arrhenius, published as No. 1 of this series.—F. W. WOLL.

Report upon the administration of the public works department in Egypt for 1903, W. Garstin et al. (*Cairo: Public Works Ministry, 1904, pp. 430, pls. 6*).—This includes a report on irrigation works in 1903, which deals with the season and the water supply, assistance rendered by the Assuan reservoir, measures taken to insure water distribution, duty of water, the Zifta Barrage, the Mex pumps on Lake Mareotis, drainage, gage readings on Lake Victoria Nyanza, and miscellaneous operations.

Historic highways of America, A. B. Hulbert (*Cleveland, Ohio: Arthur H. Clark Co., 1905, vol. 15, pp. 211, pls. 9*).—This volume deals with the future of road-making in America, and contains special articles on Government Cooperation in Object Lesson Road Work, by Martin Dodge; Good Roads for Farmers, by M. O. Eldridge; The Selection of Materials for Macadam Roads, by L. W. Page, and Stone Roads in New Jersey, by E. G. Harrison.

Good roads in the United States, A. P. Brigham (*Bul. Amer. Geogr. Soc., 36 (1904), No. 12, pp. 721–735; abs. in Science, n. ser., 21 (1905), No. 524, pp. 75, 76*).—This article shows how great a handicap bad roads are to farmers and to railroads and the importance of having roads which are not affected by the weather.

Recent progress in the field of agricultural machinery, H. Walter, Strecker, E. Wrobel, A. Nachtweh, and Puchner (*Fühling's Landw. Ztg., 53 (1904), Nos. 1,*

pp. 34–40, figs. 3; 3, pp. 118, 119; 7, pp. 273–276, figs. 3; 10, pp. 389–392, figs. 3; 12, pp. 462–464, figs. 2; 19, pp. 743–746, figs. 5; 22, pp. 856–858, fig. 1; 24, pp. 932–934, figs. 3).—Notes are given on milk heaters, land-plaster distributor, harrows for grass lands, mowing-machine attachments, subsoil plow, and a faucet for liquid-manure tanks.

Report on trials of agricultural and dairy machinery at Ultuna and Alnarp, A. SJÖSTRÖM ET AL. (*Meddel. Styr. Maskin- och Redsk. Profningsanst.* [*Stockholm*], *1904, pp. 125*).—Trials were conducted with the following machines: Petroleum motor, horsesweeps, stone feed mill, seeders, lime spreaders, self-binders, hand separators, power separators, regenerative pasteurizer, churns, milk-weighing scales, milk pumps, fat-determination apparatus, and dairy salt.—F. W. WOLL.

MISCELLANEOUS.

Seventeenth Annual Report of Arkansas Station, 1904 (*Arkansas Sta. Rpt. 1904, pp. VIII+106*).—This includes the organization list of the station, a brief report of the director, a financial statement for the fiscal year ended June 30, 1904, and reprints of Bulletins 77 to 82 of the station on the following subjects: Cowpea experiments (E. S. R., 15, p. 666); the relative digestibility of some edible fats and oils (E. S. R., 15, p. 700); peach growing in Arkansas (E. S. R., 15, p. 871); cowpea hay (E. S. R., 15, p. 864); fertilizers (E. S. R., 15, p. 958); and live stock sanitation in Arkansas (E. S. R., 15, p. 1007). The report of this station for 1902 (E. S. R., 15, p. 829) included reprints of the bulletins issued during 1903. No other report of this station for 1903 has been published.

Hawaiian Sugar Planters' Station Report, 1904 (*Hawaiian Sugar Planters' Sta. Rpt. 1904, pp. 66*).—This consists of a general report on the work of the station during the year by the committee of the Hawaiian Sugar Planters' Association having this matter in charge; more detailed reports of the divisions of chemistry, agriculture, and entomology, and several articles noted elsewhere.

Seventeenth Annual Report of Indiana Station, 1904 (*Indiana Sta. Rpt. 1904, pp. 38*).—This includes the organization list of the station, a report of the director reviewing the work and commenting on the financial needs of the station, reports of the different departments, lists of periodicals received and of the publications of the station to December 1, 1904, and a financial statement for the fiscal year ended June 30, 1904.

Seventeenth Annual Report of Michigan Station, 1904 (*Michigan Sta. Rpt. 1904, pp. 107–275*).—This contains a financial statement for the fiscal year ended June 30, 1904; a report of the director; departmental reports; meteorological tables noted elsewhere; and reprints of Bulletins 211–216 and Special Bulletins 20–23 of the station on the following subjects: Breakfast foods (E. S. R., 16, p. 77); seed testing for farmers (E. S. R., 16, p. 168); small fruits for 1904 (E. S. R., 16, p. 266); tomatoes and potatoes (E. S. R., 16, pp. 258, 263); experiments with sugar beets in 1903 (E. S. R., 16, p. 361); a brief review of Special Bulletins Nos. 24, 25, and 26 (E. S. R., 16, p. 385); report of the Upper Peninsula Substation for the years 1901 and 1902 (E. S. R., 15, p. 349); cheese problems (E. S. R., 15, p. 607); the crop of corn (E. S. R., 15, p. 1070); and a preliminary note on the associative action of bacteria in the souring of milk and in other milk fermentations (E. S. R., 15, p. 1113).

Tenth Annual Report of Montana Station, 1903 (*Montana Sta. Rpt. 1903, pp. 103, figs. 3*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; lists of station publications, donations, and exchanges; and reports of the director and heads of departments which contain results of experimental work abstracted elsewhere.

Twenty-sixth Annual Report of North Carolinia Station, 1903 (*North Carolina Sta. Rpt. 1903, pp. 156*).—This contains a general report of the director on the

work of the station and more detailed reports by the heads of divisions; a financial statement for the fiscal year ended June 30, 1903; 6 papers abstracted elsewhere; reprints of 5 press bulletins dealing in a popular manner with the treatment of grain smut, weevil in grain and other stored products, silk culture, and potato scab; and reprints of Bulletins 182–185 of the station on the following subjects: Apples in North Carolina (E. S. R., 15, p. 40); fungus diseases of the apple, pear, and quince (E. S. R., 15, p. 163); insect enemies of the apple, pear, and quince, with methods of treatment (E. S. R., 15, p. 168); the culture and marketing of orchard and garden fruits (E. S. R., 15, p. 581); the black rot of the grape in North Carolina and its treatment (E. S. R., 15, p. 591).

Twenty-first and Twenty-second Annual Reports of Ohio Station, 1901–2 (*Ohio Sta. Rpts. 1902–3, pp. XXV + 138; XIX + 156*).—This is made up of reprints of Bulletins 129–143 of the station issued during the 2 years, and already abstracted in the Record.

Fifteenth Annual Report of Oregon Station, 1903 (*Oregon Sta. Rpt. 1903, pp. 62*).—This includes a financial statement of the station for the fiscal year ended June 30, 1903; and reports of the director and heads of departments, parts of which are noted elsewhere.

Sixteenth Annual Report of Oregon Station, 1904 (*Oregon Sta. Rpt. 1904, pp. 47*).—This report on the college and station includes a financial statement for the fiscal year ended June 30, 1904, and reports of the director and heads of departments. Some of the work upon which brief reports are made is noted elsewhere in this issue.

Annual Report of Pennsylvania Station, 1903 (*Pennsylvania Sta. Rpt. 1903, pp. IV + 250*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; a report of the director on the work of the station during the year; departmental reports which include summaries of the different lines of station work; several articles noted elsewhere; and reprints, with minor changes, of Bulletins 62, 64, and 65 of the station on the following subjects: An experiment in ginseng culture (E. S. R., 14, p. 861); methods of steer feeding (E. S. R., 15, p. 894); forage and soiling experiments, 1902 (E. S. R., 15, p. 998); and also Bureau of Animal Industry Bulletin 51 on the available energy of timothy hay (E. S. R., 15, p. 799).

Annual Report of the Director, H. P. Armsby (*Pennsylvania Sta. Bul. 69, pp. 12*).—This is a summary of the work of the station during the year 1903–4 with specific recommendations concerning the needs of the station.

Seventeenth Annual Report of Rhode Island Station, 1904 (*Rhode Island Sta. Rpt. 1904, pp. 289 + IX, pls. 8*).—The report of the director presents a rather detailed outline of station work during the year, with statements of some of the more important results obtained. The reports of the divisions of horticulture, agronomy and chemistry, and meteorology contain several articles noted elsewhere. A financial statement for the fiscal year ended June 30, 1904, and a list of exchanges are appended. An article on Tent Covering for Vegetables and Strawberries has been abstracted from another source (E. S. R., 16, p. 667).

Twenty-first Annual Report of Wisconsin Station, 1904 (*Wisconsin Sta. Rpt. 1904, pp. 392*).—This includes the organization list of the station; a report of the director; a complete list of the bulletins issued by the station; numerous articles abstracted elsewhere; lists of exchanges and acknowledgments, and a financial statement for the fiscal year ended June 30, 1904.

Organization lists of the agricultural colleges and experiment stations in the United States (*U. S. Dept. Agr., Office of Experiment Stations Bul. 151, pp. 92 + XVIII*).

On agricultural control and experiment stations, S. Hals (*Tidsskr. Norske Landbr., 11 (1904), No. 12, pp. 529–561*).—Discussions of the subject with special reference to conditions existing in Norway.—F. W. WOLL.

Agriculture at the St. Louis Exposition in 1904, L. WITTMACK (*Mitt. Deut. Landw. Gesell., 20 (1905), No. 1, pp. 1–7*).—A description is given of the agricultural exhibits of different countries, together with a list of material in the German section on agriculture.

The American system of agricultural education, A. C. TRUE and D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Doc. 706, pp. 21, pls. 8*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition in connection with the exhibit of the colleges of agriculture and mechanic arts and the experiment stations.

Organization and work of agricultural experiment stations in the United States, D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Doc. 708, pp. 24, pls. 5*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition.

Description of exhibit of colleges of agriculture and mechanic arts and experiment stations, Louisiana Purchase Exposition, St. Louis, Mo., 1904, W. H. BEAL (*U. S. Dept. Agr., Office of Experiment Stations Doc. 710, pp. 23, pl. 1*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition.

Farmers' institutes in the United States, J. HAMILTON (*U. S. Dept. Agr., Office of Experiment Stations Doc. 711, pp. 20*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition.

Investigations on the nutrition of man in the United States, C. F. LANGWORTHY and R. D. MILNER (*U. S. Dept. Agr., Office of Experiment Stations Doc. 713, pp. 20, pls. 6*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition.

Irrigation and drainage investigations of the Office of Experiment Stations, U. S. Department of Agriculture, R. P. TEELE (*U. S. Dept. Agr., Office of Experiment Stations Doc. 723, pp. 23, pls. 2, figs. 5*).—A pamphlet prepared for distribution at the Louisiana Purchase Exposition.

Agriculture for beginners, C. W. BURKETT, F. L. STEVENS, and D. H. HILL (*Boston and London: Ginn & Co., 1904, pp. VI+58, figs. 48*).—This is a special supplement to the book of the above title already noted (E. S. R., 15, p. 199). It contains a more extended treatment of some of the topics already considered in the original work, with some additional matter. The larger part of the supplement is devoted to the subject of market gardening and vegetable culture, with chapters on flower gardening, forage crops, and the cotton-boll weevil.

Agricultural bibliography of Belgium (*Bibliographie Agricole Belge. Brussels: Cercle Études Agron., 1904, pp. 170*).—This is the first part of a bibliography of Belgian agricultural literature, and includes all books, pamphlets, and articles of more than 10 pages which have appeared since 1880. The second part, to be issued during the coming year, will include all other agricultural articles by Belgian writers during the same period. The publications are classified into 42 groups and arranged chronologically in each group. Lists of the publications of the Belgian Department of Agriculture and of the principal agricultural journals of Belgium are appended.

NOTES.

Hawaiian Sugar Planters' Station.—It is reported that Dr. N. A. Cobb, formerly of Sydney, New South Wales, has been appointed plant pathologist to the station and has accepted the position. A new laboratory is being erected for his department.

Illinois University.—Plans have been made to hold a State conference on The Problems of the Rural School at the university during the last week in June. School directors, trustees, county superintendents, and other school officers throughout the State, and the teachers of rural schools will be invited to take part in this conference to consider such questions as the teaching of agriculture, domestic science, and manual training in the rural schools, as well as problems connected with the consolidation of rural schools, the development of rural high schools, and rural school architecture. The conference will be preceded by a two weeks' preliminary session for the training of rural teachers in agriculture, mechanic arts, and domestic science.

Purdue University.—The State legislature has appropriated $100,000 for the erection of a chemical laboratory and a school of civil engineering at the university.

Kansas College and Station.—The State legislature has made the following appropriations for the next two years: For a horticultural building, greenhouses and equipment, $50,000; addition to the boiler room, $3,000; three 125-horsepower boilers and stacks, $10,000; addition to the engine room, $3,000; granary, $4,000; and current expenses, $90,000 for 1906 and $100,000 for 1907. The amount appropriated is about $20,000 more than that appropriated by the legislature two years ago. Arrangements have been completed for tests of varieties of grains and corn at a number of county poor farms in cooperation with the experiment station, the seeds being furnished by the farm department. A soil physics laboratory has been fitted up and equipped.

New Hampshire College.—The State legislature has appropriated $50,500 for the college under the following heads: Gymnasium and drill hall, $25,000; general expenses, $20,000; president's house, $5,500. The last item is to supplement the insurance money received after the burning of the house formerly occupied by the president.

New York State Station.—F. D. Fuller, for more than eight years an assistant chemist of the station, has accepted a position as State chemist in charge of concentrated feeding stuffs, under the Pennsylvania department of agriculture. R. C. Bisbee, a graduate of Bowdoin College, has been appointed assistant chemist to succeed F. A. Urner, who recently resigned to accept a business position.

Oklahoma College.—The legislature has appropriated $75,000 for a building for the departments of agriculture and horticulture and for administration, to be known as "Morrill Hall;" $15,000 for additional shops and recitation rooms for mechanical, electrical, and civil engineering; $2,500 for a gymnasium, and $8,000 for acquiring the rights of lessees on the section of land adjoining the original college farm, recently granted to the college by Congress. An increase of $5,500 per annum in the funds provided for the support of the college by the Territory was granted. A special course in agriculture for normal school teachers is offered for the first time this spring.

Rhode Island Station.—A scheme of cooperation with the Bureau of Soils of this Department has just been arranged by which two or more assistants will be detailed from the Department to study certain questions in soil fertility at the station, under the direction of the chief of the Bureau of Soils, the station furnishing the facilities.

According to the terms of the agreement the station is to be supplied by the Bureau of Soils with certain apparatus and two assistants for studying, under the supervision of the director of the station, the question of the action of sodium salts upon soils and plants. In the work thus far done at the station it has been found that with certain species of plants the yields are very decidedly increased by the application of sodium salts, even in the presence of 330 lbs. per acre of muriate of potash or its equivalent of potassium carbonate.

South Carolina College and Station.—H. Benton, assistant professor of agriculture, has resigned, to take effect July 1, 1905, to accept a position in the Bureau of Plant Industry. B. H. Rawl has resigned from the division of animal husbandry and dairying to take a position in the dairy division of this Department, which he entered upon April 1. His work will be mainly in connection with dairy husbandry in the South. The State summer school for teachers will be held this year at the college, beginning June 21.

South Dakota College and Station.—The State legislature has made the following appropriations for the next two years: Salaries, $13,000 a year; maintenance, $18,200 for 1906 and $17,700 for 1907; farm expenses, $3,000 a year; the forage testing station at Highmore, $1,200 a year, an increase of $200; farmers' institutes, $5,000 a year; purchase of additional land, $16,000; furnishing the horticultural and engineering buildings, $800. This is the first time that an appropriation has been made in the State for farmers' institutes.

Virginia College and Station.—Plans are being made for the rebuilding of Science Hall, recently destroyed by fire. Delegates from the college of agriculture and the experiment station have been holding farmers' institutes during the winter and spring in cooperation with the State department of agriculture. The station has assisted at about 40 institutes, and its work has been placed before the people of the State in a way it never has been before. This work has been received with much favor and has served to arouse widespread interest throughout the State.

Wyoming University.—The people of Lander have come into the possession of the Wiser estate of $40,000, which was bequeathed for an agricultural college. A board has been appointed which has purchased a farm, leased buildings, and employed a faculty, with a view to securing the Government funds. The legislature having refused to transfer these funds, it is stated that an attempt will be made to secure them through the courts. Horticultural experiments will be made at Lander upon a former substation farm, under a State appropriation of $2,000, the work being in charge of a commission consisting of the director of the station and two others. A State board of horticulture has been created, with the professor of botany and zoology as ex-officio member, and a nursery inspection law passed. Heretofore there have been no regulations regarding the shipping of nursery stock into the State.

New Buildings for the United States Department of Agriculture.—It has been decided to locate the new buildings for this Department 106 ft. farther west, and to sink the structures 10 ft. lower in the ground than was previously planned. This decision is in accordance with the plans of the Park Commission appointed by the Senate some years ago. The details which have been worked out by this commission since the publication of their report make the above changes necessary in order to conform to the general scheme in the matter of the grade and the relative position of buildings. As the excavation for the two laboratory wings as originally located had been completed, these changes will involve some delay in the work.

Score Card for Judging Dairies.—A score card for judging the sanitary condition of dairies has been proposed by Prof. R. A. Pearson, of Cornell University, and adopted by the Syracuse Farmers' Club. Twenty points are allowed to each of the following general divisions: (1) Health of the herd and its protection, (2) cleanliness of the cows and their surroundings, (3) utensils, (4) attendants, (5) handling of milk. Each division has 3 or more subdivisions.

If the total score is 96 or above, and each division is 18 or above, the dairy is considered excellent; if the total score is 90 or above, and each division is 16 or above, the dairy is good; if the total score is 80 or above, and each division is 12 or above, the dairy is medium; and if the total score is below 80, or any division is below 12, the dairy is poor. It would seem as if some such score card as this might prove useful in dairy inspection.

Summer Course in Experimental Zoology.—The Ohio State University Lake Laboratory, at Cedar Point, offers a new course of study for the coming summer in experimental zoology, which will interest those who are engaged upon the problems of breeding. The course is to cover especially the questions of animal variation and heredity, and will be accompanied so far as practicable by laboratory and field experiments. It will be in charge of Dr. William E. Kellicott, of Barnard College, Columbia University. The locality is said to possess some excellent advantages for this special work.

Study of Skeletons of the Horse.—The natural history branch of the British Museum is attempting to collect the skulls and limb bones of horses of known pedigree, without regard to breed, and has invited the cooperation of horse owners. In commenting upon this undertaking, *Nature* suggests that while the purpose for which the collection is being made is not specified, those who have kept abreast of zoological literature for the last year or two have noticed the attention which is being directed by naturalists to the problem of the origin of the various breeds of domesticated horses, and especially to the idea that thoroughbreds and Arabs have a different parentage from the "cold-blooded" horses of western Europe.

"The circumstances that some horses of eastern origin show a vestige of the cavity for the 'tear-gland' of the hipparions has been recently brought to notice as an important factor in the problem. To ascertain the frequency of this feature is probably one of the objects of making the collection, while a second may be to ascertain the constancy of certain proportionate relations between the limb bones of racers and cart-horses." The museum already possesses the skeletons of several famous horses, and has the promise of others.

Personal Mention.—Prof. Emerich Meissl, of the Austrian ministry of agriculture, died February 15 at the age of 50. Professor Meissl was for more than twenty years connected with the agricultural experiment station at Vienna, being director from 1886 to 1898. At that time he was called to the ministry of agriculture as an agricultural-technological expert, and was promoted to the charge of a section in the ministry in 1902, which position he occupied at the time of his death. He was widely known among agricultural chemists, having made many contributions upon agricultural analysis, and the chemistry of sugars, milk, and the fermentation industries. He also conducted investigations upon the physiology of animal nutrition and upon plant nutrition. For the latter work he built and equipped a thoroughly modern vegetation house at Korneuburg, near Vienna. Dr. Meissl also gave attention to the subject of moor culture, and is spoken of as a pioneer in rational moor culture in Austria. He had long been prominent in the leading agricultural organizations of his country and in all public matters relating to agriculture. A quite full account of his life, by Dr. F. Strohmer, is given in No. 16 of the current volume of the *Wiener Landwirtschaftliche Zeitung*, to which he was a frequent contributor.

A complimentary banquet was tendered Dr. W. C. Stubbs by the Louisiana Sugar Planters' Association at the St. Charles Hotel, New Orleans, March 18, the occasion being the retirement of Doctor Stubbs from public service, as previously announced. The banquet was attended by about one hundred persons, including the governor of the State, leading representatives of the sugar industry in the various parts of the State, merchants, bankers, scientists, and educators. High tribute was paid to Doctor Stubbs by the speakers for his distinguished services to the sugar industry of the

State and the general scientific advancement of its agriculture, and there were many warm expressions of the respect and affection in which he is held.

Albert F. Woods, of the Bureau of Plant Industry, has been delegated to attend the Second International Botanical Congress, to be held at Vienna in June, and the International Congress of Agriculture at Rome.

Dr. Oscar Brefeld, director of the Vegetable Physiological Institute of Breslau, has temporarily retired on account of a serious affection of the eyes.

Dr. A. Ernst has become professor of botany and director of laboratories at the University of Zurich.

Prof. F. W. Neger, of the forest school at Eisenach, has been chosen professor of botany at the Forest Academy of Tharandt, to succeed Dr. F. Nobbe, who, as previously announced, has retired. Dr. W. Migula, associate professor in the technical high school at Carlsruhe, succeeds Professor Neger at the forest school at Eisenach.

Prof. A. S. Packard, of Brown University, widely known as an entomologist and an extensive writer upon that subject, died February 14, at the age of 66 years.

The course of Saturday afternoon lectures at the National Museum, under the auspices of the Biological Society of Washington, this year included addresses by Dr. L. O. Howard on Mosquitoes (March 25), Dr. A. D. Hopkins on Forest Insects and their Destructive Work (April 1), and Dr. George T. Moore on Beneficial Bacteria (April 8).

It is announced that the annual meeting of the Association of German Naturalists and Physicians will be held this year at Meran, Austria, September 25 to 30.

A preliminary notice has been received of the Second International Congress of Dairying, to be held at Paris in October next.

M. Viger has been elected president of the French Society of Horticulture.

The Liebig medal for researches in agricultural chemistry has been awarded by the Munich Academy of Sciences to Dr. Adolf Frank, of Charlottenburg.

Miscellaneous.—The Burma government has decided, according to a note in *Nature*, quoted from the *Pioneer Mail*, to discontinue the experiments for the improvement of the silk industry in the more important silk centers of the province by the importation of silkworm eggs from France. Owing to climatic and other causes, rearing has failed with foreign imported eggs, and it is not considered worth while pursuing the experiments without the aid of an expert.

The Madras government has, according to a note in *Nature*, sanctioned the establishment of an experimental garden in Malabar to study the peppervine disease.

A department of agriculture has recently been established in the British Colony of the Fiji Islands, with Mr. Charles H. Knowles as superintendent of agriculture.

The Mexican department of agriculture, according to a note in *Science*, is planning a series of meteorological stations, to be connected by telegraph with the meteorological observatory in the City of Mexico.

Two prizes for the best treatises on the rational food for man have, according to a note in *Nature*, quoted from the *Chemist and Druggist*, been offered by Dr. Henri de Rothschild, through the Scientific Society of Alimentary Hygiene, Paris. The prizes are 5,000 and 3,000 francs, respectively. They will be awarded in 1906, and the papers must be sent in by the close of this year.

The announcement of the summer session at Columbia University mentions courses in the chemistry of nutrition, by Dr. H. C. Sherman; in food production and manufacture, by Prof. H. T. Vulté; in household chemistry, by Professor Vulté; and in the theory and practice of teaching nature study in elementary schools, and biological nature study, by Prof. M. A. Bigelow and Miss Ada Watterson.

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EXPERIMENT STATION RECORD.

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An interesting instance of agricultural experimentation under private auspices is brought to light in the current volume of *The Journal of the Royal Agricultural Society of England*. It illustrates the value which such work may have in bringing about an improved agriculture and establishing a new system of management. The article is by Director A. D. Hall, of the Rothamsted Station, and describes the agricultural experiments of the late James Mason, of Eynsham Hall, Oxford.

It appears that Mr. Mason was a successful business man, who had been quick to apply the teachings of science in his processes of manufacture. His experience had given him a high appreciation of what science might do for industry, and hence when he came to retire from active business about 1882, and to devote himself to the management of his large estate, his mind naturally turned in that direction. His lands, comprising about 1,800 acres, had been operated under the tenant system. He conceived the idea that by the proper application of science to the methods of agriculture, in place of the traditional rules of the old farming under the tenant system, the industry might be given something of the certainty of a manufacturing enterprise.

With this end in view, Mr. Mason inaugurated an extensive series of agricultural experiments which continued through the last twenty years of his life. While some of the work was on a laboratory scale, everything was intended to bear directly on practice, and the information gained was applied to ordinary farming conditions on the estate. Mr. Mason was in frequent correspondence with Lawes and Gilbert regarding his experiments, and had the assistance of consulting chemists when needed. He published little or nothing, and although his system and methods have been briefly described by others, Mr. Hall's account is the first summary of his operations.

The underlying idea in Mr. Mason's work was to utilize the resources of the soil and the reserves of the subsoil to a much greater extent than was done by the current system of farming; and after the discovery by Hellriegel and Wilfarth of the fixation of nitrogen by legumes through the agency of bacteria, he set about utilizing this power of leguminous plants to bring up the fertility of the land. His

scheme for unlocking the reserves of the soil depended on stirring up the subsoil and aerating it by means of deep plowing. This led to his experiments in soil weathering, which took account of the increase in available plant food and the extent of nitrification.

His work on nitrogen assimilation included an extensive series of experiments in pots and brick pits, to test the nitrogen-collecting power of the various legumes and their ability to prepare the land for carrying nitrogen-consuming crops like cereals. He had nearly sixty pits constructed of varying sizes, with arrangements for collecting the drainage water from each pit, and the whole inclosed in wire netting to keep away birds. In addition, a large number of experiments were made in glazed drainpipes set on end. The teachings of these culture experiments were extended to field experiments on a larger scale, which covered a variety of lines and were aimed at devising a new system of farming.

His success was not immediate, and he met with many discouragements in the working out of a new system, but, as Mr. Hall says, "with a clear conception of the principles he wished to translate into practice, he pursued them through repeated failures until he found the working conditions necessary for their application." A very complete system of farm bookkeeping was established by him upon taking up this work, and from a consideration of the balance sheets and of the conditions of his fields, Mr. Hall concludes that the experimenter solved the problem he set himself—"how to utilize, on the one hand, the natural resources of the subsoil, and on the other the nitrogen-fixing power of the leguminous crops. He showed that by the introduction of lucern, a crop previously unknown on these clay soils, a leguminous growth could be obtained which would endure for some years at a small expense for tillage, and produce sufficient keep to pay for the heavy initial outlay for deep cultivation and manures. Finally, on the fertility thus accumulated, either good crops of roots and corn could be grown, or the land could be successfully brought into the state of permanent pasture."

Mr. Mason also carried on experiments in the feeding of steers and hogs. In these he did not work out any new ideas, but was aiming at economic production as a part of his farming system.

His method of using alfalfa for the improvement of the poor clay land of his section was a novelty and, as it has been justified by the results of several years, it is believed that it will gradually spread and become a part of the tradition of farming on such land.

In the annual report of the Wisconsin Station for the past year the director makes a reply to those who have urged the establishment of branch experiment stations in various parts of the State. He agrees that "there is nothing more plausible to the novice in these matters

than the establishment of branch stations for agricultural research, as a means of quickly and successfully solving a whole lot of knotty agricultural problems of special importance to the particular districts of the State." The argument is borne out by the fact that the soil on which the station is located and the environment are not representative of any considerable part of the State, a condition which holds true in practically every State of size.

In considering this question the greatest good to the agriculture of the whole State must be taken account of rather than the immediate benefit of a particular locality or branch of farming. Director Henry points out that it costs far more to maintain a branch station properly, so that it may accomplish much in the line of research, than the legislatures or the people generally appreciate, and that to keep up these branch stations and at the same time properly maintain the central station is a heavier burden than the State usually cares to bear. For these reasons it is believed better, until considerably more funds are available, to maintain a strong central station and to attack the special and local problems in the most direct manner possible by experts from the central station rather than to build up permanent branch stations.

This, as is well known, is the policy which this Office has advocated in the past, and has insisted upon except where the State legislatures have seen fit to provide for branch stations. The experience of a number of the States in the early days in establishing in some cases as many as five or six branch stations is evidence of the fallacy of that plan unless supported by an efficient home station. There must first be a fundamental working basis before the application of scientific principles to improving agricultural practice can be made. At the time the stations were established there was no true science of agriculture in a comprehensive sense, and it has been necessary in many lines to build from the ground up, and even to spend considerable time in testing and disproving old theories. Such work requires concentration of effort and good working facilities, and, as pointed out, the legislatures in few States have felt able to make all the provision desirable for even a single central station.

By building up a strong system of central stations a vast amount of exact information and reliable experience have been secured, and many of the underlying principles have been worked out to such an extent as to make future investigations and their application more intelligent and reliable. There can be no question that the agriculture of the whole country is immeasurably better off for this course of concentration, and the product of the Wisconsin Station stands out as a notable example in this respect. It is abundant justification of the policy which Director Henry has pursued, and has had a very wholesome and inspiring influence on experiment station work throughout the country.

It is not contended, of course, that the work of the central station is to be confined to its locality, either in specific problems or in applications. In every State there are numerous agricultural problems demanding solution which can best be studied in the midst of their local surroundings. To attack these problems the central station should reach out to the point of greatest interest, and establish, if necessary, temporary stations under the direct supervision of the experts at the central station. This has always been held a legitimate use of the Hatch Fund and an important function of the station. It enables the work to be accomplished at the minimum expense, and it confines the operations of the temporary branch station to the special problems in hand. It does not call for a duplication of the scientific force and equipment of the central station, but utilizes these facilities in working out the technical phases of local problems. In this it broadens the outlook and the experience of the men connected with the central station, and it provides for the local problem facilities which it would otherwise be entirely impracticable to furnish.

In illustration of the economy of this method, Director Henry cites the extensive cranberry studies which are being conducted by the Wisconsin Station at Cranmoor, on rented lands in cooperation with the Wisconsin Cranberry Growers' Association. He also mentions the tobacco experiments which are in progress in several counties, and the experiments on peat and muck soils, which have involved much preliminary laboratory study. In this way, and through individual cooperators, the work of the station is spreading well over the State, and accomplishing a vast amount of good at comparatively very small expense.

The experience of Wisconsin is duplicated in a majority of other States, where the stations are reaching out to the specific local problems to the greatest extent practicable with their limited funds. In order to extend this feature of their work, some twenty States have made provision for maintaining local or branch stations, or in two or three cases independent stations for special problems. We have, therefore, a considerable number of branch stations maintained by State funds, but these are usually on a different basis from the original substations, in that they bear a very close relation to the central station and are an attempt to make local application of the station's findings.

In North Carolina, for example, four stations have been established under the State department of agriculture upon typical soils of the State, in order to study the soil and farm management of those localities, so that an intelligent application may be made of the principles worked out at the central station and in other States. The same has been done in Ohio and Mississippi. In Kansas, Nebraska, and Utah branch stations or farms have been provided for studying dry or arid farming; in South Dakota for studying forage plants; in Texas for

horticultural work, and in other States for special purposes. But the central idea of a strong State station, permanently located, has been preserved and has gained a deeper hold year by year.

The extension of the station work is only natural, considering the size of many of the States and the demand for station work in various lines which has grown out of the interest and confidence which have been developed. The station bulletins, the agricultural press, and the farmers' institutes are carrying the results of the station work to the farmer. Agricultural experiment associations, numbering in some cases thousands of members, are testing the local application of new kinds and varieties of plants, methods of culture, remedies for diseases, etc. In a number of States the county poor farms are now being utilized as demonstration farms and for testing purposes. But with the growth of the work other agencies will undoubtedly be needed. These the State should provide, but in doing so it should see to it that the union with the central station is preserved, in order that the system may be strengthened and the purely investigational work developed along with the local application.

A list of the abbreviations used in this journal has been prepared for publication and will soon be issued. The number of periodicals now referred to in the abstract part of the Record, some of them quite regularly and others only occasionally, has become so large as to make a list of the abbreviations used for them almost a necessity to readers who wish to look up articles in the original. The list now includes some sixteen hundred periodicals, which come from many countries and represent at least ten different languages. Some of these are journals issued at regular intervals; others are annuals, proceedings and transactions of societies and other organizations, reports of standing commissions, State and municipal officers and institutions, and still others public documents issued serially.

There have been a number of requests that a list of the abbreviations used be published, and the matter has been in contemplation for some time. It is not, however, so simple as might appear. There is considerable confusion in the serial publications of some institutions, successive numbers appearing under slightly changed titles, or possibly as a new series. The names of established journals are changing, and new periodicals are being added constantly. The occasional reports, bulletins, and leaflets of foreign institutions give perhaps the most trouble, owing to lack of consistency in the title. For example, a line of work will be reported one year from an agricultural college by a county council, apparently as one of the latter's publications, and the next year from the agricultural department of the university with which it appears the college is affiliated; or a series of botanical investigations will be issued for a time by the botanical department of

an experiment station, and then suddenly changed to the botanical department of the technical museum in the same town, making it uncertain whether both series of publications should be retained on the list, or one substituted for the other.

Part of this difficulty is due to carelessness in adhering to a uniform serial title for the publications of an institution or a department of it, and part to lack of continuity of the work and lack of organization. No one who has not had to deal with these matters, as a librarian or a reviewing editor has to, can fully appreciate the difficulties it gives rise to, or the real disadvantage to the institutions or investigators themselves, in burying their publications from the public. But, remembering the great difficulty in securing regularity in the bulletins of our own experiment stations, it is easier to account for a lack of consistency where publication is less frequent and the continuity less certain.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Methods of analysis of fertilizers adopted by the Association of German Agricultural Experiment Stations (*Landw. Vers. Stat., 60 (1904), No. 5–6, pp. 371–382*).—A compilation, with references to literature, of the action of the association up to and including the Breslau meeting in September, 1904, regarding methods of preparing samples, determining fine meal in Thomas slag, moisture in superphosphates, water-soluble and citric acid and citrate soluble phosphoric acid, total phosphoric acid (with limits of error allowed), nitrogen in different forms, potash, lime, and magnesia, iron oxid and alumina, perchlorate in nitrate of soda, and examination of sulphur.

Methods of analysis of fertilizers adopted by the Fifth International Congress of Applied Chemistry at Berlin, 1903 (*Landw. Vers. Stat., 60 (1904), No. 5–6, pp. 399–404*).—A brief summary is given of the general rules adopted regarding sampling, determination of water, insoluble matter, phosphoric acid, iron oxid and alumina, nitrogen in different forms, potash, lime, and magnesia.

A quick method of determining potash, F. KLINKERFUES (*Chem. Ztg., 29 (1905), No. 7, pp. 77, 78*).—A method involving the direct evaporation of the water solution with platinum chlorid, washing with alcohol, dissolving the double salt in hot water, decomposing with formic acid, and weighing the metallic platinum is described.

On the determination of potash in soils, A. LEVI (*Staz. Sper. Agr. Ital., 37 (1904), No. 7–8, pp. 595–599*).—The method proposed, which is claimed to be shorter than that ordinarily used, is as follows:

Boil 50 gm. of the soil for 1 hour in 250 cc. of hydrochloric acid (1.1 sp. gr.), cool, and make the volume to 500 cc.; evaporate 200 cc. of the filtered solution repeatedly to dryness to remove silica, take up in dilute hydrochloric acid, add barium chlorid to remove sulphates, make slightly alkaline with ammonia, and add ammonium carbonate to complete precipitation; make the volume to 500 cc., evaporate 250 cc. of the filtered solution to dryness, and ignite to remove ammonium salts; take up in dilute hydrochloric acid and again evaporate to remove excess of acid; take up in water and add platinum chlorid and proceed as usual.

Phosphoric acid determinations by the method of ignition with magnesium nitrate and by that of digestion with acids, B. L. HARTWELL, A. W. BOSWORTH, and J. W. KELLOGG (*Jour. Amer. Chem. Soc., 27 (1905), No. 3, pp. 240–244*).—A modified Neubauer method was compared on turnips and the oat plant with a method in which the organic matter was destroyed by ignition with magnesium nitrate. The results by the modified Neubauer method were on the average about 3 per cent higher than by the other method, due it is thought to impurities in the magnesium pyrophosphate obtained by the citric acid method.

On the determination of calcium oxid in the presence of phosphoric acid, K. K. JÄRVINEN (*Ztschr. Analyt. Chem., 43 (1904), No. 9, pp. 559–562; abs. in Jour. Chem. Soc. [London], 88 (1905), No. 507, II, p. 62*).—It is pointed out that there are two sources of error in the determination of calcium in the presence of phosphoric acid, namely, incomplete precipitation of the lime and the contamination of the precipitate with phosphoric acid.

To avoid these errors the author uses the following method: Add ammonia to the solution freed as thoroughly as possible from ammonium salts until calcium phosphate just begins to separate; redissolve the precipitate with a drop of hydrochloric acid, heat the solution to boiling and pour slowly into a mixture of equivalent amounts of ammonium oxalate and oxalic acid; then add ammonia not stronger than 1 per cent, drop by drop, until the solution is alkaline, and complete the determination in the usual manner.

Investigations on the determination of caustic lime in burnt lime and the solubility of calcium carbonate in ammonium nitrate solution, G. Berju and W. Kosinenko (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 419-425*).—It was found that Bodenbender and Ihlee's ammonium-nitrate method gives accurate results when the mixture of carbonate and oxid contains 8 per cent or more of the latter. Shake 3 to 5 gm. of the substance, according to the amount of carbonate present, in 1 liter of fifth-normal ammonium nitrate for 3 hours in a rotary apparatus making 40 revolutions per minute, and determine lime in the usual way in an aliquot of the subsided solution.

The examination of waters and water supplies, J. C. Thresh (*Philadelphia: P. Blakiston's Son & Co., 1904, pp. XVI+460, pls. 19, figs. 11*).—This book is based very largely on the author's own observations and investigations. It lays special stress upon the importance of a more careful examination of the sources from which waters are derived, the microscopical and biological examination of suspended matter in addition to the ordinary bacteriological examination, and more complete chemical analyses than those ordinarily provided for.

The work is divided into three parts, dealing in detail with the examination of the sources from which water is derived (shallow and deep wells and springs, surface water supplies, rivers and streams, service reservoirs, mains, etc.); various methods of examining waters and the interpretation of the results (objects and methods of analysis, and interpretation of the results of physical, chemical, microscopic and biological, and bacterioscopic examinations); and analytical processes and methods of examination (collection of samples of water, chemical and physical examination of water for sanitary purposes, estimation of the saline constituents, determination of the gases dissolved in water and evolved therefrom, analysis of the sinter deposited by water, analyses of waters from various geological sources, and bacteriological, microscopic, and biological examination of water).

Notes on the determination of nitrogen as nitrites in waters, R. S. Weston (*Jour. Amer. Chem. Soc., 27 (1905), No. 3, pp. 281-287*).—Experiments are reported which bear out Ilosvay's claim that the substitution of acetic acid for hydrochloric acid in the Griess-Warington method increases its rapidity and delicacy.

The volumetric determination of carbon dioxid, F. Schulze (*Ztschr. Landw. Versuchsw. Oesterr., 8 (1905), No. 1, pp. 70-72*).—The author describes a method in which the carbon dioxid generated is collected over concentrated calcium chlorid solution in a Schulze-Tiemann nitric acid apparatus.

Combustible compounds in the air, H. Wolpert (*Arch. Hyg., 52 (1905), No. 2, pp. 151-178, fig. 1*).—From an extensive series of investigations the author concludes that outdoor air contains incompletely oxidized carbon compounds, the proportion in Berlin being at least 0.015 volume per 1,000, which is about 4.5 per cent of the carbon content of the air. The air in rooms when pure contains the same amount of these carbon compounds as the outer air. Products of combustion of illuminating gas and respiratory products increase the proportion of incompletely oxidized carbon compounds markedly.

Physical chemistry in the service of agriculture, F. K. Cameron (*Jour. Phys. Chem., 8 (1904), No. 9, pp. 637-647; abs. in Chem. Centbl., 1905, I, No. 6, p. 464*).—A paper read before the physical chemistry section of the International Congress of Arts and Science at St. Louis in 1904. It cites a number of examples of ways in

which physical-chemical principles are, or may be, aids to the study of agricultural problems both as regards analytical processes and broader methods of research.

Analysis of foods and the detection of adulterants, C. Girard (*Analyse des matières alimentaires et recherche de leurs falsifications. Paris: Vve. C. Dunod, 1904, pp. 849; rev. in Amer. Chem. Jour., 32 (1904), No. 5, pp. 516–519*).—A second and enlarged edition of this work, which is designed as a compendium for the use of chemists engaged in the study of foods and the detection of adulterants and all who are concerned in the execution of pure food laws. A number of authors have contributed sections or chapters.

The reviewer calls attention to the fact that in the sections on milk and butter "the quick commercial method of determining butter-fat in milk, devised by Babcock, which is entirely satisfactory for all ordinary purposes, is not even mentioned."

Methods of detecting adulteration in food products, C. Margot (*Recettes pour découvrir les falsifications des produits alimentaires. Paris: Ernest Flammarion, 1904, pp. 188; rev. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 3, p. 284*).—Simple methods are given for the detection of the more common forms of food adulteration.

The rapid examination of the more important foods and condiments, S. Lenobel (*Anleitung zur raschen Prüfung wichtiger Lebens- und Genussmittel. Vienna and Leipzig: A. Hartleben, pp. IV+29; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 2, p. 127*).—Simple methods are given for detecting adulteration.

The estimation of volatile acids in wine, K. Windisch and T. Roettgen (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 2, pp. 70–81, fig. 1*).—Determinations of total volatile and nonvolatile acids in a large number of samples of wine are reported and analytical methods discussed. The authors note that in the majority of wines more or less of the total acid and with ciders nearly all the so-called nonvolatile acid is lactic acid. The fact that lactic acid may be distilled with water vapor, though with difficulty, and its property of forming anhydrid, are discussed with reference to the determination of acid in wine.

Some practical applications of the precipitin method in food chemistry, A. Schütze (*Ztschr. Hyg. u. Infectionskrank., 47 (1904), pp. 144–152; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 3, pp. 152, 153*).—Experiments are reported which showed that when rabbits were injected with egg yolk the blood serum contained a precipitin which served for the identification of small amounts of egg yolk in oleomargarine and egg noodles.

The detection of palm oil when used as a coloring material in oils and fats, C. A. Crampton and F. D. Simons (*Jour. Amer. Chem. Soc., 27 (1905), No. 3, pp. 270–274*).—This is the full text of a paper presented at the Philadelphia meeting of the American Chemical Society, previously noted (E. S. R., 16, p. 621).

Cooperative work on the titer test, Association of Official Agricultural Chemists, 1904, L. M. Tolman (*U. S. Dept. Agr., Bureau of Chemistry Circ. 22, pp. 16*).—This is a report of cooperative tests of the Dalican and Wolfbauer methods. "The general opinion of the collaborators is that the constant stirring method of obtaining the titer is the most satisfactory and that the method of saponification is immaterial. The chief point of nonagreement is on the drying of the fatty acids." A tentative method was proposed for criticism.

Comparative investigations on the determination of the fat content of milk by the Gerber method and the milk refractometer, A. Einecke (*Mitt. Landw. Inst. K. Univ. Breslau, 3 (1904), No. 1, pp. 147–155*).—In 3 series of experiments with goats in which rape-seed oil, cocoanut oil, and linseed oil were added to a normal ration in different feeding periods, determinations of the fat in the milk were made by the Gerber method in comparison with the Zeiss milk refractometer. Gravimetric determinations were also made.

In all cases the oil feeding influenced the iodin number of the butter fat and also the refractometer number, the variations in the latter, however, being much smaller

and within limits which were considered of no importance in practice. It is not believed that the refractometer method can replace the Gerber method on account of the greater time and skill required in its use.

The analysis of condensed milk, J. B. P. HARRISON (*Analyst, 29 (1904), No. 341, pp. 248–256*).—Methods are given for determining total solids, ash, fat, proteids, cane sugar, and milk sugar in sweetened condensed milk. The author investigated the determination of cane sugar by polarization before and after inversion with acid mercuric nitrate. Complete inversion of the cane sugar was believed to be accomplished by keeping the acid solution in a briskly boiling water bath for 7 minutes, which was not believed to affect the milk sugar.

The chemical composition of maple sirup and maple sugar, methods of analysis, and detection of adulteration, J. HORTVET (*Jour. Amer. Chem. Soc., 26 (1904), No. 11, pp. 1523–1545, fig. 1*).—About 50 samples of maple sirup and maple sugar of known purity from several States were subjected to chemical analysis, the methods employed and the results obtained being reported.

It is believed that the determination of the precipitate with lead subacetate affords valuable data in the routine examination of maple products. "In doubtful cases this result may be confirmed either by the determination and examination of the ash or by the determination of the malic acid value. In still more doubtful cases and in cases where litigation is involved a full analysis may be required." For the purpose of suggesting standards of purity, maximum, minimum, and average results obtained are summarized.

The identification of artificial coloring matter in mustard, P. BOHRISCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 5, pp. 285, 286*).—The results of tests for artificial coloring matter in mustard are reported.

The composition of turmeric, A. E. LEACH (*Jour. Amer. Chem. Soc., 26 (1904), No. 10, pp. 1210, 1211, fig. 1*).—Turmeric is described and analyses of 3 varieties reported.

The chemical examination of a number of the new commercial preservatives for meat and meat products, E. POLENSKE (*Arb. K. Gesundheitsamte, 20 (1904), pp. 567–572; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 2, pp. 101, 102*).—A number of analyses are reported.

The quantitative estimation of carbamates, J. J. R. MACLEOD and H. D. HASKINS (*Amer. Jour. Physiol., 12 (1905), No. 5, pp. 444–456*).—A method of estimating carbamates in blood serum and other proteid materials is proposed. This depends upon determining the amount of carbon dioxid in the original material containing both the carbonates and carbamates, and in a second sample from which the carbonates have been precipitated with a saturated aqueous solution of barium hydroxid containing ammonia. In the case of the second sample either the liquid or the precipitate is used for the determination of carbonates, according to circumstances.

The chemistry of the protein bodies of the wheat kernel. I, The protein soluble in alcohol and its glutaminic acid content, T. B. OSBORNE and I. F. HARRIS (*Amer. Jour. Physiol., 13 (1905), No. 1, pp. 35–44*).—Some recent investigations are critically discussed and experimental data are reported. The authors do not believe that the evidence which has been presented justifies the conclusion that the alcohol-soluble protein of wheat consists of 2 distinct proteid bodies. Their own investigations having to do with this question led to the following conclusions:

"Fractional precipitations of this alcohol-soluble protein yield practically the same large proportion of glutaminic acid, so that, in view of their very close agreement in composition and properties, both physical and chemical, we have every reason to believe that only one such protein is present, for which, we think, the name gliadin should be retained.

"Gliadin yields a remarkable proportion of glutaminic acid, much in excess of that from any other known protein, and greater than that of any single decomposition product yet obtained in a pure state from any other true protein substance, the protamines, of course, excepted.

"This very large proportion of glutaminic acid in a food protein, so extensively used, is a matter of great importance in relation to the food value of this substance, and deserves further careful study."

On a globulin occurring in the chestnut, W. E. Barlow (*Jour. Amer. Chem. Soc., 27 (1905), No. 3, pp. 274–276*).—The characteristics of a globulin separated from Spanish chestnuts are described. For this body the author proposes the name "castanin."

"The facts brought out so far show . . . that the body is a true plant globulin, and that in most of its reactions it resembles the globulin of the filbert (corylin) more closely than it does other members of the group, although it differs from corylin in coagulation-temperature and in precipitation limits." The investigations will be continued.

A study of vegetable proteids, E. Cavazzani (*Arch. Farmacol. Sper. e Sci. Aff., 1904; abs. in Zentbl. Physiol., 18 (1904), No. 21, p. 675*).—The aqueous extract of lettuce, the flowers of *Brassica oleracea*, the tubers of *Tuber magnatum*, and the fresh seeds of beans and peas were found to contain a nucleon (sarco-phosphoric acid). This body, especially that obtained from peas, was very similar to camiferrin (ferrinucleon). The amount varied considerably, 0.82 per cent being present in peas.

The occurrence of peptone in seeds, W. R. Mack (*Ztschr. Physiol. Chem., 42 (1904), No. 3, pp. 259–273*).—The author isolated a peptone from dormant yellow lupine seeds and studied its properties. This peptone, like that produced by digestive ferments, had marked acid characteristics, and cleavage with hydrochloric acid resulted in the formation of lysin, arginin, and glutamic acid.

Certain carbohydrate reactions, I, R. and O. Adler (*Arch. Physiol. [Pflüger], 106 (1905), No. 6–7, pp. 323–328*).—The authors summarize and discuss data regarding the color reactions which carbohydrates give when heated with phenol in the presence of acid and similar color tests and report the results of studies with different carbohydrates.

BOTANY.

The growth of plants in atmospheres enriched in carbon dioxid, E. Demoussy (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 21, pp. 883–885*).—The results of the author's investigations in growing lettuce in an atmosphere enriched in carbon dioxid have been questioned as being too limited to permit of generalizations. The author has repeated his experiments with 16 species of plants, representing a wide range of families.

Duplicate series were grown, one in normal atmosphere containing about 3 parts of carbon dioxid in 10,000, and the other series in an atmosphere enriched daily by about five times the normal quantity of carbon dioxid. The experiments were continued for about 2 months, after which the aerial portions of the plants were weighed. Among the species studied were coleus, lettuce, geraniums, centaury, mint, tobacco, balsam, fuchsias, etc. In all except the fuchsias there was a decided increase in the weight of the plants, the average amounting to over 60 per cent increase. In addition, the geraniums, begonias, mints, etc., were hastened in their flowering and flowered more abundantly in the atmosphere enriched in carbon dioxid than was the case with the plants grown under normal conditions.

The influence of carbon dioxid of the soil on plants, E. Demoussy (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 5, pp. 291–293*).—By means of pot experiments the author has shown that low-growing plants, such as lettuce, are influenced

very materially by the carbon dioxid which is given off by soils. It is easily demonstrated that the carbon dioxid content of the air is greater near the surface of the soil than at a higher point, and low-growing plants are able to utilize this increased supply.

The variation in the rate of increase in the growth of plants, Miss M. Stefanowska (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 5, pp. 304–306; 139 (1904), No. 21, pp. 879–881, figs. 2*).—The author has studied the rate of increase in weight during the growth of maize, peas, and oats in water cultures, radishes, lettuce, purslane, and oats in soil, and a number of molds in Raulin's solution.

Curves are presented showing the rate and time of increase, and formulas are deduced for estimating the rate and gain. In some cases a constant though varying increase was shown, but in the case of *Penicillium glaucum* there was a rapid increase in rate up to the time of fruiting, after which there was a sharp falling off that corresponded closely with the age of the cultures.

The effect of colored light on the growth of plants, silkworms, etc., C. Flammarion (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 10, pp. 1171–1179, figs. 2*).—In continuation of investigations previously reported (E. S. R., 13, p. 576; 14, pp. 548, 553), the author gives the results of studies on the effect of different colored light on the growth of begonias, sugar beets, pansies, stocks, silkworms, etc.

The experiments with sugar beets showed a decided depreciation in the weight of the beets grown under the different colored glass, and also a falling off in the sugar content. Plants grown under white glass screens gave results most nearly comparable with those grown in the open. These were followed by the plants grown in red, green, and blue light, in the order named. With the silkworms the results were inconclusive, but the red light seemed to favor their development.

Notes are given on an attempt to grow strawberries under different colored glass, the effect of electricity on the growth, sugar content, etc., of sugar beets, and the results obtained with carrots, onions, black salsify, and beans planted during the different phases of the moon.

Influence of light on carotin and on the destruction of enzyms, F. A. F. C. Went (*Rec. Trav. Bot. Neerlandais, 1904, No. 1, pp. 106–119; abs. in Bot. Centbl., 96 (1904), No. 41, p. 380*).—The orange coloring matter in *Monilia sitophila* is said to be carotin, and it is formed only in the presence of light. The fungus grows readily in the dark but remains colorless. Fifteen minutes exposure to light is sufficient to start the formation of carotin.

Investigations made by a number of authors have shown the abundant presence in the fungus of an enzym, maltoglucase, which is rapidly destroyed in the light. The author's experiments with the fungus showed that the orange yellow coloring matter served to protect the enzym against too rapid destruction, and it is argued that the presence of carotin in some of the higher plants may be for the protection of the enzyms which they contain.

Viridescense and proliferation produced by parasites acting at a distance, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 22, pp. 930–932*).—The author shows that a number of instances of green flowers produced by white and red clover and melilotus, and a peculiar fasciation of *Senecio jacobæa*, could be traced to insect injuries, in nearly every instance the larvæ being found present in the roots or low in the stems of the affected plants.

The solution of reserve material in the cell walls of seed during germination, A. R. Michniewicz, (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 112 (1903), No. 4–7, pp. 483–510, pls. 2*).—A report is given of investigations on the storing of reserve material in the cell walls of the endosperm of seed, and the utilization of this material by the plantlet during germination. The storing of reserve material in the different parts of the cell walls was extensively observed, occurring in many

species of monocotyledonous and dicotyledonous plants, and its localization and methods of solution and use are discussed. A brief bibliography is given.

The action of formaldehyde on the respiration of plants, A. Benedicenti and G. B. de Toni (*Atti. R. Inst. Veneto Sci., Let. et Art., 61 (1901-2), No. 2, pp. 329-350; abs. in Bot. Centbl., 96 (1904), No. 48, pp. 427, 428*).—The different theories regarding the formation of formaldehyde in plants as a process in carbon dioxid assimilation are reviewed. The authors do not accept the theory that formaldehyde is a definite product of the plant, but show that it is highly injurious to plant life. If formed at all in the plant it must be immediately condensed into some form of carbohydrate or other substance rich in carbon.

To test the effect of formaldehyde on plants a large number were grown under sharply controlled conditions, in which formaldehyde was added to the atmosphere and the carbon dioxid evolution accurately determined. At first the amount of carbon dioxid evolved was greatly increased, the formaldehyde seeming to have a stimulating effect on the plants, but later there was a marked diminution, and the total carbon dioxid given off was less than that liberated by plants growing in normal atmospheres. If continued for a sufficiently long time the plants were invariably killed.

The duration of the stimulus and the death of the plant were in almost direct proportion to the amount of formaldehyde present. The periods of normal fluctuation in the respirative activity of the plants were not affected except when the amount of formaldehyde was excessive.

The physics and physiology of protoplasmic streaming in plants, A. J. Ewart (*Oxford: Clarendon Press, 1903, pp. 131; abs. in Bot. Centbl., 96 (1904), No. 46, pp. 502, 503*).—The author shows that the velocity of streaming is largely dependent upon the viscosity of the protoplasm, and hence upon the percentage of water present. Within certain limits, as the temperarure rises the viscosity decreases, increasing the velocity of streaming.

The energy expended in protoplasmic streaming is a very small fraction of that produced by respiration. The force required increases enormously as the diameter of the passage decreases, so that the transference of masses of highly viscous protoplasm becomes practically impossible except in the case of relatively large connecting strands of sieve plates. The energy for streaming can be derived either from aerobic or anaerobic respiration.

Strong light retards streaming, while weak light may indirectly accelerate it in chlorophyll-bearing cells. Acids, alkalis, and metallic poisons retard, while dilute alcohols and anesthetics accelerate streaming, but when concentrated they always retard it. Electric currents, when not too strong, were found to accelerate protoplasmic streaming.

Investigations on the acidity of plants, E. Charabot and A. Hébert (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 26, pp. 1714-1716*).—Studies are reported on the acidity of plants, particular attention being paid to the volatile acids in such plants as peppermint, geranium, sweet basil, bitter orange, etc.

In the case of peppermint, the maximum of free volatile acids was constantly highest in the leaves. The amount of volatile acids was found to vary at different times, decreasing at the time of the appearance of the inflorescence, increasing with the expansion of the flowers, and diminishing to a minimum at a later stage. It was found that plants grown constantly in the shade showed a higher acidity in the root than in the leaves. The suppression of the inflorescence increased the volatile acids in the leaves, to the detriment of other organs of the plants.

The authors have also determined the alkalinity of the ash of the different plants, which it was found reached a maximum in the ash of the leaves. In the case of plants grown in the shade the proportion of combined organic acids increases, and at

the same time the insoluble portion of the ash increases. By the suppression of the inflorescence there is a reduction in the proportion of the combined organic acids.

Localization of thein in the tea plant, A. NESTLER (*Jahresber. Ver. Vertreter Angew. Bot., 1903, p. 54; abs. in Bot. Centbl., 96 (1904), No. 42, p. 404*).—According to the author's summary, thein is not found present in the roots or in all the above-ground organs of the tea plant.

The sprouting seed of *Thea viridis* and *T. bohea* contain in the seed coats as well as in the cotyledons a considerable amount of thein. The thein is present in both old and young stems, but is always localized in the bark and not in the wood. It is also present in the trichomes and mesophyll of the leaves, and in all parts of the tea flower. The claim that thein is strictly localized in the normal epidermal cells is not correct.

Soil inoculation for legumes, G. T. MOORE (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 71, pp. 72, pls. 10*).—This bulletin gives the results of the author's investigations on the fixation of nitrogen by leguminous plants, a preliminary account of which has been noted (E. S. R., 15, p. 227). It also gives brief reports upon the successful use of artificial cultures by practical farmers.

After discussing the problems of nitrogen fixation and reviewing considerable literature relative to the subject, the author describes his investigations on the isolation and cultivation of the organism concerned in the fixation of nitrogen. The previous attempts at inoculation through cultures or the transfer of soils are discussed, particular attention being paid to the use of Nitragin, a substance prepared in Germany, but which appears to have given little satisfaction in this country.

The nature of the organism of nitrogen assimilation is discussed, as well as its specific characters, and the author finds that on account of the occurrence of the flagellæ at one end, the generic name of the organism should be changed, and the name now becomes *Pseudomonas radicicola*. The effect of varying conditions of light, heat, air, alkalies, acids, etc., on the development of the organism and nitrogen fixation are discussed at some length, and the question of symbiotic or parasitic action is considered.

Attention is called to the fact that the use of the cultures prepared by the author have in a number of instances been attended with highly beneficial results, even though there were no nodules formed. An examination, however, of some of the smaller roots showed that the organisms were abundant in the cells without having formed the characteristic nodules which have been considered an important factor in nitrogen assimilation. Since the author's investigations were begun about 12,500 packages of inoculating material have been distributed throughout the United States, and reports from some of those who received the material are briefly summarized. It is claimed that of 2,500 reports with the principal leguminous crops, failures were reported in only about 26 per cent.

The author summarizes his investigations, showing that leguminous plants can flourish in soils practically devoid of nitrogen through their ability to obtain atmospheric nitrogen by the aid of these micro-organisms, and the effect of legumes on subsequent crops is highly beneficial. Where nitrogen-fixing bacteria are lacking in soils they can be introduced artificially, either by the transfer of soil or by the use of pure cultures of the micro-organisms. In order to increase and maintain the activity of the nodule-forming organisms it is claimed that they must be cultivated on nitrogen-free media. Heat, moisture, alkalinity, available nitrogen in the soil, all have direct effects upon the growth of the bacteria, and the failure to develop nodules may be in most instances traced to one of these causes.

The nitrogen is fixed by the bacteria and becomes available by the action of the plant in dissolving and absorbing the combined nitrogen in these organisms. The author claims that there is no true symbiosis between the bacteria and the host plant, the nodule-forming organism being purely parasitic, and unless the plant can over-

come its action it is distinctly harmful. Artificial inoculation should be made at the time of planting, if possible, but subsequent inoculations have proved beneficial. Where soils already contain the proper bacteria, inoculation will usually have little or no benefit, and it should not be practiced where the soil is rich in available nitrogen.

Cultures of plants in the presence of a mixture of algæ and bacteria, Bouilhac and Giustiniani (*Compt. Rend. Acad. Sci.* [*Paris*], *138* (*1904*), *No. 5, pp. 293–296*).—By means of pot cultures of buckwheat, white mustard, maize, cress, etc., grown with and without algæ and bacteria, the authors have shown that the presence of the organisms increase the nitrogenous content of the soil and that through their intervention an increased amount of nitrogen is available for plant growth. This increase is shown not only in a higher dry weight, but also in the amount of nitrogen in the plants as well as the nitrogen fixed by the organisms.

The authors hope to extend this investigation so as to make it practicable for field culture.

The utilization of the nitrogen of the air by plants, A. Stutzer (*Deut. Landw. Presse*, *31* (*1904*), *Nos. 10, pp. 73, 74; 11, pp. 81, 82; 12, pp. 89, 90; 17, pp. 137, 138; 19, pp. 157, 158*).—A general discussion of this subject.

Report of the Agricultural, Chemical, Bacteriological, and Plant Protection Station, Vienna, 1903, F. Dafert and K. Kornauth (*Ztschr. Landw. Versuchsw. Oesterr.*, *7* (*1904*), *No. 3, pp. 117–172*).—After describing the organization, facilities, etc., of the station and giving the personnel of the staff, a report is made of the many lines of work carried on. In the chemical laboratory a large number of analyses of fertilizers, forage plants, etc., are reported, a decided increase being shown over the previous year.

In the section of plant culture the investigations reported were largely along the line of fertilizer tests. Moor culture occupies an important part in the station's investigations. The bacteriological work reported upon includes many microscopic examinations for the detection of adulterants of food and feeding stuffs, as well as examinations of a purely bacteriological nature. Experiments are reported on the use of bacteria for destroying rats and mice, a considerable number of cultures of the organisms having been distributed during the year.

Notes are given on various parasitic fungi and injurious insects observed during the year, especial attention being called to the occurrence of *Peronospora cubensis* on cucumbers. Attempts were made to combat various fungus and insect pests.

A detailed report is made on the inoculation of peas with root tubercle organisms and oats with Alinit, *Bacillus megatherium*, *B. subtilis*, etc. With the peas the greatest gains were obtained in the pots whose soil and seed had been sterilized and then inoculated with pure cultures. Where the soil was sterilized and the seed not treated, the greatest yield of tops and seed was from the pots receiving a soil inoculation. In experiments with oats the inoculated pots in nearly all cases gave larger yields, the averages being 62.5 gm. for the check, which received a complete fertilizer, 66.2 gm. where inoculated with Alinit, 66.5 gm. where inoculated with *B. megatherium*, and 76 gm. where inoculated with *B. subtilis*.

A brief report is given on the treatment of seeds for the prevention of smuts. Copper sulphate solutions and dry powdered copper sulphate were not wholly efficient. Better results were obtained in preventing millet smut by soaking the seed for 5 minutes in a $\frac{1}{2}$ per cent solution of formalin. Laboratory and plat experiments indicated that smut spores are not always destroyed by soaking in solutions of copper sulphate.

Notes on mycorrhiza occurring on the lateral roots of peppers, J. de Cordemoy (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 1, pp. 83–85*).—The occurrence of mycorrhiza on the adventitious roots of peppers, as well as vanilla, is reported. These plants are supported upon living trees by lateral roots, and through

the fungus symbiont a direct relationship is established between the clinging vine and its living support. The fungus seems to be truly parasitic on the supporting host, and as it grows more readily upon some trees than others the superiority of some species over others as supports for peppers, vanilla, etc., is explained.

Symbiosis between fungi and bacteria, E. ZEDERBAUER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 112 (1903), No. 4–7, pp. 447–482, pls. 2*).—According to the author the order Myxobacteriaceæ, established and named by Thaxter, is not a definite plant group, but a biological association similar to that recognized in lichens. The Myxobacteriaceæ, according to his investigations, are the results of the symbiotic association of species of fungi and bacteria. This conclusion is arrived at as a result of a study of many of the forms and by the experimental evidence furnished from the cultivation of two of the recognized forms in which the symbiotic relationship was demonstrated.

The author separates a number of the so-called species into their components, and most of them are described as new species.

Seed and Plant Introduction, Inventory No. 10, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 66, pp. 333*).—This inventory of seeds and plants imported by the Department for experimental purposes covers the period from September, 1900, to December, 1903, and includes nearly 4,400 accession numbers. The most of the material represented in the list was secured by the writer, but in addition large collections were obtained by a number of the Department agricultural explorers and others. In addition to listing the different accessions, in many instances descriptive notes are given on the different varieties.

ZOOLOGY.

The biological and economic significance of the coloration of domestic animals, L. ADAMETZ (*Oesterr. Molk. Ztg., 11 (1904), Nos. 17, pp. 234–237; 18, pp. 249–251; 19, pp. 263–265; 20, pp. 275–278; 21, pp. 289–291; 22, pp. 303–305; 23, pp. 317–320; 24, pp. 332–334*).—The author discusses the supposed origin of coloration of animals and the effect of domestication upon these colors. Notes are presented on melanism, flavism, stripes and spots as observed in domestic animals, albinism, leucism, the effect of inbreeding upon coloration, the rôle of coloration in modern breeding and related topics.

As a result of the author's study of this problem it is concluded that the color of domesticated animals is correlated with their resisting power, with the character of their tissues, and especially with their ability to take care of themselves. It is argued that if the connection between the constitution of domesticated animals and the pigmentation of the skin and hair should be shown, more attention must be given in the future to a study of body color.

The mammals of Great Britain and Ireland, J. G. MILLAIS (*London: Longmans, Green & Co., 1904, vol. 1, pp. XX+365, pls. 87*).—The purpose of the present volume is to deal in as exhaustive a manner as possible with the mammals which at present inhabit Great Britain and Ireland, together with brief notes on prehistoric species. The mammals belonging to this region are classified in a systematic manner, excellent illustrations are given in color and in black and white, and detailed accounts are presented of the life history, habits, and economic relations of all species discussed. In this volume attention is given to the cheiroptera, insectivora, and carnivora.

The hamster in Belgium from 1899 to 1904, P. DERWA (*Bul. Agr. [Brussels], 20 (1904), No. 5, pp. 945–961*).—The author gives a description of the hamster and presents notes on the distribution of this animal in various parts of Europe. Its habits are also briefly described. Various methods have been tested in destroying

the pest. The best results, however, have been obtained from the use of bisulphid of carbon according to a method proposed by Briest. This consists simply in introducing small receptacles resembling cartridges into the burrows of the hamsters. The receptacles are about 2 cm. in height and 3 cm. in diameter.

Combating animal pests by means of micro-organisms, K. KORNAUTH (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 4, pp. 365–387*).—The literature of this subject is critically discussed. The author presents a digest of results thus far obtained by different authors in combating insects and injurious mammals by means of pathogenic micro-organisms.

Hypodermic injections of Bacillus typhimurium in the control of field mice, A. CUGINI and C. MANICARDI (*Staz. Sper. Agr. Ital., 37 (1904), No. 1, pp. 5–14*).—The author considers that there are only 2 effective methods for combating field mice, viz, the use of poison and destruction by means of infectious disease.

Experiments were made in the inoculation of mice which were subsequently set free in order to carry the contagion to other mice. Notes are given on the results thus obtained, and directions are presented for the preparation of cultures and the inoculation of captured mice so as to spread the disease most effectively. This method of controlling field mice is believed to satisfy the scientific, practical, and economic requirements of a successful method.

The use of bacterial cultures in destroying rats and mice, C. O. JENSEN (*Maanedsskr. Dyrlæger, 16 (1904), No. 8, pp. 271, 272*).—Brief notes are presented on the successful use of bacterial cultures in destroying rats and mice. Two commercial products containing pathogenic bacteria have been prepared under the names ratin and ratinet.

Prevention of damage by rats, M. ROBERTS (*Jour. Jamaica Agr. Soc., 8 (1904), No. 12, pp. 492, 493*).—The author has suffered considerable loss by the damage due to rats attacking half-grown cocoa pods. The usual methods of destroying these pests by traps and poison proved unsatisfactory. Cultures of rat virus were imported and were found to operate very successfully. Directions are given for using this virus.

Report of the commissioners of inland fisheries and game of the State of Maine, 1904, L. T. CARLETON ET AL. (*Rpt. Comrs. Inland Fisheries and Game, Maine, 1904, pp. 83, pls. 11, fig. 1*).—A brief account is presented of the work done at various fish hatcheries in the State.

Deer are said to be decreasing in numbers, and this fact is attributed to over-destruction by hunters. The moose also appear to be somewhat fewer in numbers than during previous years. Caribou are almost never observed in Maine at present. An account is given of the license system for hunting in Maine, together with notes on the reported cases of the illegal killing of the moose in 1904, accidents to hunters, game-warden service, registered guides, and recommendations regarding game laws.

A brief account is presented of the economic relations to agriculture of a few birds, including the ruffed grouse and the robin.

Warning against trespass on the Breton Island reservation, J. WILSON (*U. S. Dept. Agr., Biological Survey Circ. 45, p. 1*).—This is a notice of an order by the President setting aside Breton Island as a game preserve, and forbidding hunting or the collection of eggs in that island.

Report on scientific work in the natural history of vermes in the year 1900, VON LINSTOW ET AL. (*Arch. Naturgesch., 63 (1904), II, No. 3, pp. 506*).—A classified bibliography with brief abstracts of the more important literature relating to different groups of vermes, bryozoa, tunicates, brachiopods, rotifers, echinoderms, and sponges.

The birds of North and Middle America, III, R. RIDGWAY (*Smithsn. Inst., U. S. Nat. Mus. Bul. 50, 1904, pt. 3, pp. XX+801, pls. 19*).—This constitutes the continuation of the author's monograph of the birds of North and Middle America,

including a detailed discussion of species belonging to the following families: Motacillidæ, Hirundinidæ, Ampelidæ, Ptilogonatidæ, Dulidæ, Vireonidæ, Laniidæ, Corvidæ, Paridæ, Sittidæ, Certhiidæ, Troglodytidæ, Cinclidæ, Chamæidæ, and Sylviidæ.

Birds of New Jersey, S. R. MORSE (*Ann. Rpt. New Jersey State Mus., 1903, pp. 39–133, pls. 44*).—This is a general account of bird life in New Jersey in which all of the species known to occur in the State are listed and described and notes are given on the habits with especial reference to their economic importance. The destruction of birds is briefly discussed and notes are given on the migration and the causes of this phenomenon. In addition to detailed descriptive notes on numerous species a copy is given of a New Jersey law for the protection of birds.

Saskatchewan birds, R. T. CONGDON (*Trans. Wisconsin Acad. Sci., Arts and Letters, 14 (1903), pt. 2, pp. 569–620, pls. 8*).—The observations reported in this article were made largely during the spring and summer of 1902 during the tour of collection and study in the Saskatchewan region. Detailed notes are given on the occurrence, distribution, habits, and economic relations of various species of birds observed in that region.

The economic value of our native birds, H. A. SURFACE (*Pennsylvania Dept. Agr., Zool. Quart. Bul., 2 (1904), No. 2, pp. 37–48, figs. 2*).—Brief notes are given on the feeding habits of cuckoos.

Directions for collecting birds' stomachs, C. H. MERRIAM (*U. S. Dept. Agr., Biological Survey Circ. 46, p. 1*).—Brief directions for collecting and shipping birds' stomachs to the Department for examination relative to their food content.

Protection of seed against crows (*Jour. Bd. Agr.* [*London*], *11 (1904), No. 9, pp. 544, 545*).—Brief notes are given regarding beneficial results obtained in Europe from the treatment of seed wheat with mixtures of coal tar, petroleum, carbolic acid, and other substances which render the seed unpalatable to crows.

METEOROLOGY—CLIMATOLOGY.

The evolution of climate, M. MANSON (*Science, n. ser., 20 (1904), No. 519, pp. 801, 802*).—A paper read before the Philosophical Society of Washington, in which "in opposition to the modern views which attribute geological climate to solar control and the glacial epoch to astronomical causes, the author emphasizes the influence of the dense aqueous atmosphere which must have surrounded the earth in early times, and the change that occurred when the sun's rays could reach the surface. The ice-age was a transition period between the long periods of earth-controlled and sun-controlled surface temperature."

Meteorological observations, J. E. OSTRANDER and G. W. PATCH (*Massachusetts Sta. Met. Buls. 193, 194, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1905. The data are briefly discussed in general notes on the weather of each month.

Meteorological report, 1902–3, 1903–4 (*New Hampshire Sta. Rpt. 1904, pp. 265–316*).—Daily, monthly, and annual summaries of observations at Durham, N. H., on pressure, temperature, precipitation, direction of wind, cloudiness, etc., for the period from July, 1902, to June, 1904, inclusive. The mean temperature of the year ended June 30, 1904, was 42.7° F. (for the 9 years ended on that date 45°), precipitation 46.98 in. (9 years 45.62), snow 77.1 in. (9 years 58.5), number of rainy days 81 (9 years 98), cloudy days 125, prevailing direction of the wind NW.

Meteorological summary, 1903–4 (*New Hampshire Sta. Bul. 115, p. 177*).—The detailed report from which this summary is taken is noted above.

Meteorology, C. B. RIDGAWAY (*Wyoming Sta. Rpt. 1904, pp. 41, 42*).—A summary of observations at Laramie, Wyo., on temperature, relative humidity, dew-

point, atmospheric pressure, precipitation, evaporation, and direction and velocity of the wind during the year 1903.

Weather conditions at Manor Farm, Garforth, E. P. KAYE (*Univ. Leeds and Yorkshire Council Agr. Education, [Pamphlet] 45, 1904, pp. 10–13, charts 2*).—A summary of the weather conditions during each month of the year ended September 30, 1904.

Meteorological and river observations, (*Kulturtechniker, 7 (1904), No. 4, pp. 316–332*).—A summary of observations at a number of different places in Schleswig during June to August, 1904, and measurements of the height of the Oder and Neisse during the months of January to June, 1904.

Report of the work of the station of agricultural climatology at Juvisy during 1903, C. FLAMMARION (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 11, pp. 1326–1339, figs. 7*).—This report contains a tabular and diagrammatic record of the temperature of the air during each day and month of 1903 and of the average annual and seasonal temperatures from 1885 to 1903; observations on barometric pressure, humidity, cloudiness, rainfall, direction of the wind, hours of sunshine, and solar radiation; a comparison of the monthly temperatures of the air with those of the water in two wells; and notes on the shedding and renewing of leaves. The meteorological conditions during 1903 were as a rule normal.

Radiation and terrestrial temperature, C. G. ABBOT (*Science, n. ser., 20 (1904), No. 519, pp. 802, 803*).—This paper, which was read before the Philosophical Society of Washington, discusses "the substantial equilibrium of temperature of the earth, and consequent equality of solar radiation absorbed in and about the earth to that emitted from and about the earth to space."

The diurnal and annual periods of temperature, humidity, and wind velocity up to four kilometers in the free air, and the average vertical gradients of these elements at Blue Hill, H. H. CLAYTON (*Ann. Astron. Obs. Harvard College, 58 (1904), pt. 1; abs. in Science, n. ser., 21 (1905), No. 533, pp. 433–435*).—This is a summary of results of observations by means of kites at the Blue Hill Observatory, with the principal conclusions drawn from this work.

The absorption of light by the atmosphere, A. BEMPOROD (*Zur Theorie der Extinktion des Lichtes in der Erdatmosphäre. Mitt. Grossh. Sternwarte zu Heidelberg, pp. 78; rev. in Nature [London], 71 (1905), No. 1843, pp. 402, 403*).

WATER—SOILS.

The purification of drinking water by electrical methods, L. GERARD (*Jour. Soc. Cent. Agr. Belg., 52 (1905), No. 3, pp. 87–97*).—The various methods of purification of drinking water by means of ozone produced by electrical means are described and their efficiency discussed.

Water resources of the Philadelphia district, FLORENCE BASCOM (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 106, pp. 75, pls. 4, figs. 3*).—"The paper presents a summary of the knowledge of the water resources of Philadelphia and vicinity, including both surface and underground waters. In the discussion of the former a considerable number of data which have appeared in scattered and inaccessible publications are brought together and presented with the new material. The facts relating to underground waters are largely new and are the result of a personal canvass of the region."

Quality of water in the Susquehanna River drainage basin, M. O. LEIGHTON (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 108, pp. 76, pls. 4, figs. 7*).—"In this paper is presented a brief introductory chapter on the physiographic features of the Susquehanna basin, by G. B. Hollister, which is followed by a detailed discussion of the population and industries in New York. Numerous analytical reports are presented which show the character of the unpolluted waters in the

main stream and its various tributaries, and the effects which have been produced by industrial and domestic pollution.

"Of special importance are the statements concerning the effect of mine wastes. It is shown that such wastes are not without their beneficial effects, especially in those parts of the river which have been set aside as areas for sewage disposal. The discussion of this matter, together with the consideration of the amount of mine wastes discharged into Susquehanna River, is one of the important features of the paper."

The amounts of nitrogen as ammonia and as nitric acid, and of chlorin in the rain water collected at Rothamsted, N. H. J. Miller (*Proc. Chem. Soc. [London], 18 (1902), No. 250, pp. 88, 89; abs. in Centbl. Agr. Chem., 34 (1905), No. 1, pp. 1, 2*).—"Results of monthly determinations of nitrogen as ammonia and as nitrates in the rain water collected during 13 harvest years (September, 1888, to August, 1901) at Rothamsted, showed that the total nitrogen in these forms varied from 3.31 lbs. to 4.43 lbs. per acre per annum," the average for the year being 3.84 lbs. "Of the total nitrogen 70 per cent was present as ammonia and 30 per cent as nitrates. During the summer months there was an increased production of ammonia, whilst the amount of nitric nitrogen (per acre) was nearly the same in summer as in winter."

The results of monthly determinations of chlorin during 24 years show that "the yearly amounts of chlorin in the rain vary considerably (maximum 21.19, minimum 10.32 lbs. per acre). The variations depend less on the total rainfall for the year than on the amount of rain during the winter months. The rain falling at Rothamsted supplies not only sufficient chlorin, but also enough sulphuric acid for the requirements of most crops."

The amounts of nitrogen, as nitrates, and chlorin in the drainage through uncropped and unmanured land, N. H. J. Miller (*Proc. Chem. Soc. [London], 18 (1902), No. 250, pp. 89, 90; abs. in Centbl. Agr. Chem., 34 (1905), No. 1, pp. 65, 66*).—The results of studies on this subject are thus summarized by the author:

"The percolation through the 20, 40, and 60 in. of soil in the three Barnfield drain gages amounted during 24 harvest years (September, 1877, to August, 1901) to 14.39, 15.30, and 14.41 in. per annum, being 50, 53.2, and 50.1 per cent, respectively, of the rainfall for the same period. The maximum and minimum drainage occur in November and June.

"The average loss of nitrogen, as nitrates, in the drainage is more than 30 lbs. per acre per annum, and about half of this loss takes place during October, November, and December. The yearly losses of nitrogen differ widely, according to the amount and distribution of the rain and drainage. This makes it difficult to form a decided opinion as to whether nitrification is less active at the present time than in earlier years. A very decided falling off is perhaps not to be expected in the near future. The soil of the 20-in. gage is estimated to have contained, in 1870, as much as 6,000 lbs. of nitrogen per acre, and of this amount only about 15 per cent has been found in the drainage; in the case of the 60-in. gage, the estimated loss is only 6.5 per cent of the total initial nitrogen of the soil. In addition to loss of nitrogen, there is, however, a considerable loss of lime, amounting to 11 lbs. per acre (or about 20 lbs. of calcium carbonate) per inch of drainage, and this loss may, as time goes on, be expected to influence the changes in the organic matter of the soils.

"The average yearly amounts of chlorin per acre in the drainage is very similar to the amount found in the rain, but wide differences occur in some individual years. In the 24 years during which the chlorin has been determined, the soils of the 20-in. and 40-in. gages have received from the rain 7 and 14.4 lbs. of chlorin per acre in excess of the amounts lost in drainage. The 40-in. gage has lost 17.5 lbs. of chlorin."

Contribution to the solution of the question of the relation of the water content of the soil to the water requirements of plants, C. von Seelhorst and

FRESENIUS (*Jour. Landw., 52 (1904), No. 4, pp. 355–393; abs. in Chem. Centbl., 1905, I, No. 2, p. 115*).—The water requirements of oats, beets, and clover were studied in large vegetation boxes, a record being kept of the precipitation, drainage water, fluctuations of weight of the boxes (evaporation), and temperature of air and rainfall from April, 1902, to March, 1903, inclusive. The fertilizing matter (sulphuric acid, nitric acid, phosphoric acid, lime, magnesia, and potash) removed in the drainage water was also determined. Detailed data are reported and summarized, but no general conclusions are drawn.

Soils, E. RAMANN (*Bodenkunde. Berlin: Julius Springer, 1905, pp. XII+431*).—The second revised and enlarged edition of this work, which first appeared in 1895. The main subdivisions of the book are soil constituents, weathering, the most important rocks and minerals and their decomposition, soil organisms, organic residues of the soil, chemistry of soils, physics of soils, soil covering, physiography of soils, mapping of soils, principal soil types, climatic soil zones, and relation of soils and plant life.

Judging the more important physical properties of soils on the basis of mechanical analysis, J. HAZARD (*Landw. Vers. Stat., 60 (1904), Nos. 5–6, pp. 449–474, fig. 1; abs. in Chem. Centbl., 1905, I, No. 4, p. 291*).—Using the results of 350 examinations of soils made by methods described in a previous publication (E. S. R., 12, p. 1023), the author attempts to trace the relation between the size and physical character of the particles and the productiveness of a soil.

The principal conclusions reached are that the soil skeleton (particles 20 to 0.15 mm. in diameter) of sand and loam soils is of little importance as affecting water capacity and capillarity; the particles less than 0.01 mm. in diameter separated by the Schöne apparatus from clay and humus soils are not alone responsible for the productiveness of such soils, the latter being favorably influenced also by the silt (0.01 to 0.05 mm. in diameter), sand (0.15 mm.), and the capillary spaces due to coarser particles. Coarse sharp-angled rock fragments (20 mm. in diameter) increase the water capacity and cultural value of soils so long as they do not exceed one-fourth of the air-dry weight of the soil; rounded stones produce like results so long as they do not exceed one-eighth of the air-dry weight of the soil.

The most important constituents to be determined by mechanical analysis are stones and pebbles (over 20 mm. in diameter), gravel and sand (20 to 0.15 mm. in diameter), particles less than 0.15 mm. in diameter, and, when necessary, the fine sand (0.15 to 0.05 mm.). The cementing power may be determined with satisfactory accuracy by allowing a weight to fall on dried briquettes of the soil. The amount of easily determined iron compounds gives a measure of the permeability of the subsoil. In the chemical determination of the lime requirements of the soil, account must be taken of lime aggregates due to previous liming which may occur in the unsieved soil.

The available plant food in soils, H. INGLE (*Jour. Chem. Soc. [London], 87 (1905), No. 507, pp. 43–55, figs. 2*).—Pot experiments during 1901 and 1902 with barley, turnips, and horse beans on soil from the Garforth Experimental Farm extracted for 7 days with 1 per cent citric acid, as in Dyer's method, are reported. Experiments were also made with the original soil, water-washed soil, and extracted soil with lime, lime and potash, lime and phosphate, and lime, potash, and phosphate. The citric-acid soluble plant food in the soil, and the yield and the potash, phosphoric acid, and silica content of the whole plants and of the straw and seed are reported.

"The general conclusion to be drawn from the results of this investigation is that, whilst Dyer's method affords a satisfactory means of measuring the relative amounts of available plant food in two soils at a given time, it may not accurately gage their relative fertility, inasmuch as it leaves undetermined the relative rapidity with which the available plant food is renewed by the processes of weathering and decay. However, under similar climatic conditions, the rate will probably be approximately the same for most soils.

"The method, therefore, should be of great value in comparing soils, the conditions of which as to climate, etc., are similar. But its indications might lead to erroneous views as to the relative fertility of soils from tropical countries when compared with those in temperate climates, since in the former a smaller amount of available plant food in the soil, if renewed more rapidly, as it probably is, might furnish to the plants an actually greater quantity of nutriment than would be yielded by a soil containing a considerably larger amount of available food, but in which the processes by which the unavailable become available went on more slowly.

"Of the probable truth of these conclusions the writer, from a comparison of his analyses of the soils of the Transvaal with those of English soils, is fully persuaded, although he fully realizes the favoring influences of abundant sunshine and high temperature which affect the growth of plants in South Africa, and which help to explain the fact that luxuriant crops are yielded by soils which, on analysis, appear to be extremely deficient in plant food."

The analysis of the soil by means of the plant, A. D. HALL (*Jour. Agr. Sci., 1 (1905), No. 1, pp. 65–88*).—This is a detailed account of observations which have been briefly noted from another source (E. S. R., 16, p. 552).

A contribution to the devising of a method of determining the fertilizer requirements of soils by means of plant analysis, J. HANAMANN (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 11, pp. 805–818*).—A series of pot cultures with barley, conducted according to the Helmkampf method, is reported, and the bearing of the results on the accuracy of this method of determining the fertilizer requirements of soils is discussed. Ash analyses of the above-ground parts of the crops are reported, and with analyses of the seed and soil are used in calculations of the balance of the fertilizing constituents. The results indicate that at least in case of barley the analysis of the straw will give a reliable indication of the fertilizer requirements of the soil.

Soil inoculation (*Jour. Bd. Agr. [London], 11 (1905), No. 11, pp. 669–673*).—A brief account is given of methods of using the pure cultures made by Hiltner and by G. T. Moore of this Department.

Nutrition of micro-organisms. The bacterial population of the soil, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 9 (1905), No. 8, pp. 237–239*).—A brief summary of investigations by Duclaux, Fraenkel, Hohl (E. S. R., 16, p. 553), and others relating to the conditions favoring the development of micro-organisms in the soil.

Nitrogen collecting bacteria, fallow, and exhaustive culture, T. PFEIFFER (*Mitt. Landw. Inst. Univ. Breslau, 3 (1904), No. 1, pp. 93–145*).—This is a study of the organisms of the soil which fix free nitrogen without association with leguminous plants, and of the relation they bear to soil fertility under different conditions of fallow and exhaustive culture. The results clearly confirm those of Berthelot in showing the existence and activity of such organisms. The exact agricultural importance of these organisms is, however, not definitely known. It is shown that the nitrogen supply of the soil is under favorable conditions so slowly utilized that exhaustion is noted only after many years, and on rich soils is scarcely noticeable from year to year. Thorough aeration of the soil promotes the activity of the soil organisms and hastens the exhaustion of the nitrogen supply.

On bare fallow a large part of the nitrogen rendered soluble goes into the drainage water and is lost. Fallow is in all cases an extreme form of soil robbery as regards nitrogen, and its disadvantage in this respect is not compensated for by other minor advantages in improving physical condition, etc., which it possesses. Such soil robbery is not fully made good by the application of ammonium salts and nitrate of soda. Barnyard manure appears to be the best means of restoring the fertility of soils run down by exhaustive culture.

On the treatment of soils with ether, carbon bisulphid, chloroform, benzol, and hydrogen peroxid, and its effect on the growth of plants, F.

Nobbe and L. Richter (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 433-448*).—Ether and hydrogen peroxid applied to soils on which peas were grown failed to sterilize the soil and increased the yield of peas, the increase in case of ether emulsion being 41.5 per cent.

Oats on soils treated with ether, benzene, carbon bisulphid, and chloroform gave larger yields and assimilated more ash and nitrogen than on soils not so treated, the effect extending to the second crop.

The soils apparently underwent no change and the results are attributed to the direct stimulating effects of the substances applied or of the products of their decomposition.

Syllabus of illustrated lecture on acid soils, H. J. Wheeler (*U. S. Dept. Agr., Office of Experiment Stations, Farmers' Inst. Lecture 3, pp. 28*).—This lecture deals briefly with distribution of acid soils, tests for acid soils, correctives for acidity in soils, poisonous effects of sulphate of ammonia on acid soils, relation of acidity to productiveness, availability of nitrogen as affected by acidity, relation of acidity to potato scab and other plant diseases, methods of applying lime to acid soils, effect of acidity on phosphates in the soil, and relation of different plants to soil acidity.

On the humus acids of gray sand (Bleisand) and brown sandstone (Ortstein), A. Mayer (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 475-480*).—The humic acids of the "ortstein" contain less carbon than those of the "bleisand." It is suggested that the humic acids of the latter are oxidized in the presence of ferric oxid and dissolve as ferrous salts of oxyhumic acids which are afterward oxidized in the subsoil to insoluble ferric salts.

Investigations on the black soils of the Legienen Estate, Rössel, East Prussia, E. Blanck (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 407-418*).—Complete chemical and mechanical analyses of several samples are reported. These soils contained much less humus than the black soils of Russia.

Second annual report of the Reclamation Service [U. S. Geological Survey], 1902-3, F. H. Newell (*U. S. House Representatives, 58 Cong., 2. Session, Doc. 44, pp. 550, pls. 69, figs. 56*).—This is a continuation of the first annual report, the statements in which are here supplemented by an account of results obtained during the field season of 1903.

Detailed descriptions arranged in alphabetical order by States and Territories are given of the field operations. Projects under consideration or actually undertaken in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming are discussed. The aggregate fund available at the end of the fiscal year 1903 for the reclamation work from sales of public lands, fees, commissions, etc., is stated to have been $16,191,836.34.

The soil and the geological history of Morocco, S. Meunier (*Rev. Sci. [Paris], 5. ser., 3 (1905), Nos. 9, pp. 257-259; 10, pp. 296-303*).—A general account.

FERTILIZERS.

Exact methods of conducting field experiments with fertilizers, and various questions relating to the use of nitrate of soda and ammonium salts as fertilizers, P. Wagner et al. (*Mitt. Ver. Deut. Landw. Vers. Stat., 1904, No. 2, pp. IV + 95, figs. 2*).—The exact method of making field experiments with fertilizers, especially as developed by Wagner at Darmstadt, is described in detail, and experiments by the method on barley, oats, winter wheat, winter rye, potatoes, sugar beets, and fodder beets to determine the relative value as fertilizers of ammonium sulphate and sodium nitrate are reported and the results discussed in their scientific and practical bearings.

The general conclusions reached are that under favorable conditions the nitrogen of ammonium sulphate is rapidly converted into nitric acid in the soil. The conditions favoring this change are a certain degree of warmth and aeration, a very high dilution of the ammonia solution, and a high lime content, the temperature being the most important factor. As a rule it is not necessary to take special precautions to promote the formation of nitrates. If soils are acid, however, applications of lime are necessary in order to promote the unhampered action of the ammonium salts.

The experiments recorded indicate that of 100 parts of ammoniacal nitrogen applied to the soil 93 parts are obtained as nitric nitrogen. Taking the utilization of nitric nitrogen by plants grown in pots as 100, the utilization of ammoniacal nitrogen was 94. Lower results were obtained in field experiments, the comparative figure for ammoniacal nitrogen being 70 instead of 94. This loss in efficiency of the ammoniacal nitrogen is attributed to loss of ammonia by evaporation, such loss being especially high in case of soils rich in calcium carbonate.

It thus appears that calcium carbonate, while favoring nitrification, is at the same time a possible source of loss of nitrogen. This explains the fact observed by Warington, Dehérain, Giustiniani, and others, that soils poor in lime generally show a better utilization of ammoniacal nitrogen than those rich in lime. The smallest comparative effect of ammoniacal nitrogen was observed in the case of beets. Rye, oats, barley, and especially potatoes were much more benefited by applications of ammonium salts than sugar beets and fodder beets.

Cooperative experiments with mineral fertilizers on clover, O. Gorbatovski (*Bibliotek. Khozyain, 1904, Apr., pp. 84–97; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5 (1904), No. 3, p. 390*).—On 12 estates in the Government of Smolensk cooperative experiments were conducted with kainit alone as a top-dressing, with kainit and superphosphate, and with gypsum. All soils were clayey. All the fertilizers exerted a very marked action on the yield, the order of effectiveness being on an average (1) kainit plus superphosphate, (2) kainit, and (3) gypsum. In some cases, however, the gypsum acted more strongly than kainit, namely, on naturally fertile soil.—P. FIREMAN.

Defecation residue as a fertilizer. Field experiments, G. S. Likhovitzer (*Zap. Otdyel. Imp. Russ. Tekh. Obsh. Sveklosakh. Prom., 1904, No. 2, pp. 127–152; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5 (1904), No. 3, p. 392*).—On the basis of field experiments and of a survey of the literature, the author arrives at the conclusion that the defecation residue obtained in purification of sugar-beet juices increases the yield of beets on heavy soils and enhances the action of superphosphate and nitrate. In some cases the defecation residue may reduce the action of superphosphate, probably transforming its phosphoric acid into difficultly soluble compounds.—P. FIREMAN.

Fertilizer experiments with sulphate of ammonia, H. Bachmann (*Deut. Landw. Presse, 32 (1905), Nos. 12, pp. 92–94, figs. 3; 13, p. 101, figs. 3*).—Experiments by farmers during 1904 on loam and sandy soils with wheat, rye, oats, and kohlrabi are reported. Sulphate of ammonia was used in varying amounts in connection with varying proportions of Thomas slag and 40 per cent potash salt.

Judging from the way in which the results are reported, the sulphate of ammonia was in no case used alone or with an unvarying basal fertilizer. The results, therefore, do not furnish a basis for definite conclusions as to the actual effect of the sulphate of ammonia as distinct from that of the other fertilizers with which it was used.

Culture experiments with "N" fertilizer in the year 1904, F. von Lepel (*Mitt. Deut. Landw. Gesell., 20 (1905), No. 6, pp. 29–32*).—This name is applied to the mixture of nitrates and nitrites obtained by neutralizing the mixture of nitric and nitrous acid produced by oxidation of the nitrogen of the air under the influence of electrical discharges.

In pot experiments with wheat, rye, barley, and oats the "N" fertilizer compared favorably with nitrate of soda and produced no injurious effects in spite of the nitrites present. The results of the field experiments with potatoes and sugar beets were inconclusive on account of drought.

On the use of calcium cyanamid and calcium nitrate as fertilizers, R. PEROTTI (*Staz. Sper. Agr. Ital., 37 (1904), No. 9, pp. 787–805; abs. in Chem. Centbl., 1905, I, No. 2, p. 117*).—On the basis of his experiments, the author concludes that lime nitrogen may under certain conditions interfere with germination and growth of plants and the action of bacteria. When applied some time before seeding and thoroughly incorporated with the soil it is an effective fertilizer and hastens the maturity of grains.

Nitrogen and agriculture in the seventeenth century, L. THIRY (*Rev. Gén. Agron. [Louvain], 13 (1904), No. 11–12, pp. 459–472*).—A brief historical review of the knowledge of that period on this subject.

Chilean nitrate deposits (*Amer. Fert., 22 (1905), No. 1, pp. 5–9*).—This article deals with the world's supply and consumption of nitrate, exports, number of factories, and output. It is stated that according to a report of Francisco Valdes Vergara, collector of customs at the port of Valparaiso, Chile, the total exports of nitrate from Chile from 1840 to 1903, inclusive, amounted to 25,940,944 metric tons (of 2,204.6 lbs. each).

"At the end of twenty years, when 35,000,000 tons will have been extracted, it will be seen that the exhaustion of the nitrate deposits is near at hand." The increasing demands for nitrate is commented on and methods of application as a fertilizer are discussed, special reference being made to experiments at the Maryland Station (E. S. R., 16, p. 138). The American consumption of nitrate for powder making, fertilizer, etc., is stated on the authority of *Engineering and Mining Journal* to have been 275,000 long tons in 1904.

Experiments on the potash fertilization of cultivated plants, P. WAGNER ET AL. (*Arb. Deut. Landw. Gesell., 1904, No. 96, pp. VII+422*).—The results of 1,905 pot experiments and 1,441 field experiments with barley, oats, rye, potatoes, carrots, beets, and other crops, to determine the relative value of kainit and 40 per cent potash salt are reported. The average of all results shows that the kainit was somewhat more profitable than the 40 per cent salt. This is attributed in part at least to the fertilizing effect of the sodium chlorid present in kainit.

Fertilizer experiments with iron slag, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 18 (1904), No. 5, pp. 335–340*).—Finely ground "masugn" slag was found to produce good results on a moor soil low in lime. It has the advantage of slaked lime in containing some phosphoric acid and potash, which proved of benefit to the beans experimented with.—F. W. WOLL.

Can mud (bleke) replace slaked lime on soils low in lime? H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 18 (1904), No. 5, pp. 340–343*).—Experiments with peluschke beans and with oats showed that lime in mud (bleke, kalkgyttja) is of similar value when applied on moor soils low in lime as that of slaked lime.—F. W. WOLL.

Commercial fertilizers, G. ROBERTS (*California Sta. Bul. 162, pp. 22*).—The results of analyses of 80 samples of fertilizers, representing 54 brands, examined under the provisions of the State fertilizer law are reported, with various explanatory notes regarding the conduct of the inspection, the valuation of fertilizers, etc.

Analyses of fertilizers, C. A. GOESSMANN (*Massachusetts Sta. Bul. 102, pp. 40*).—This bulletin gives tabulated results of analyses of commercial fertilizers inspected under the State law and of miscellaneous fertilizing materials sent to the station for examination.

Inspection and analyses of commercial fertilizers on sale in the State, W. F. HAND ET AL. (*Mississippi Sta. Bul. 82, pp. 27*).—This bulletin contains analyses

of 262 samples of fertilizers on sale in Mississippi during the season of 1902–3. "Of this number 28, or 10.68 per cent, were below the guarantee in one or more of the essential elements and also in the relative commercial value."

Analyses of commercial fertilizers (*South Carolina Sta. Bul. 94, pp. 3*).—Analyses and valuations of 15 fertilizers are reported.

Mines and quarries, 1902 (*U. S. Dept. Com. and Labor, Bureau of the Census, Spec. Rpts., 1905, pp. XXIX+1123, pls. 40, dgms. 28*).—Among the materials of agricultural importance for which statistics are given are cement, clay, gypsum, phosphates, and marl. Advance statements of the data relating to these materials have already been noted (E. S. R., 15, p. 1063).

FIELD CROPS.

Arid farming in Utah, J. A. WIDTSOE and L. A. MERRILL (*Utah Sta. Bul. 91, pp. 67–113, figs. 14*).—This bulletin, the first report of the State Experimental Arid Farms, reviews the history of arid farming in Utah, discusses its feasibility, reports briefly the results so far obtained, and suggests future lines of work. Six experimental arid farms of 40 acres each, established by the State, are under the direction of the station.

The rainfall records for the first year show a precipitation of more than 10 in. on all farms and an average of 12.5 in. The gravel in the soils of the different farms varied from 1.05 to 20.15 per cent, the sand from 50.96 to 75.52 per cent, the silt from 13.16 to 28.48 per cent, and the clay from 9.62 to 15.75 per cent.

The highest yield of winter wheat recorded at any of the farms was 23.83 bu. and of macaroni spring wheat, 21.25 bu. Of several varieties of oats, Sixty-Day gave the best general results, the yields ranging from 3.75 to 36.01 bu. per acre. The highest yields of barley and rye recorded are 34.9 and 14.04 bu. per acre, respectively. Emmer was grown on 2 of the farms and yielded 23.55 bu. on the one, and 17.68 bu. per acre on the other. In every case fall planting of alfalfa proved a failure while spring planting produced a stand wherever tried.

Crops of corn were secured on all farms except one where frosts prevented maturity. The best yield of corn amounted to 25.93 bu. of ear corn and about a ton of stover per acre. Promising results were also obtained with sugar beets, grasses, and miscellaneous forage crops.

Report of field work done at the college station for 1903, W. R. PERKINS (*Mississippi Sta. Bul. 84, pp. 24*).—Twelve varieties of cotton were grown on small plats. The long staple varieties, Allen, Davis, and Black Rattler, were long limbed and all from 4 to 5 ft. high. Edgeworth, a tall-growing variety, but medium in limb, led in yield with 1,920 lbs. of seed cotton per acre. King, selected for 9 years, was the tallest and longest-limbed cotton in the test, and in length of staple exceeded ordinary King by more than a quarter of an inch. The effects of fertilizers on cotton were not very evident, but where 50 lbs. of nitrate of soda, 100 lbs. of cotton-seed meal, and 200 lbs. each of acid phosphate and kainit were used per acre a profit of \$3.40 was secured.

The yields of 12 varieties of corn, ranging from 26.7 to 75.1 bu. per acre, are recorded and the different varieties are briefly noted. Southern Snowflake led in yield, being followed by Mosby Prolific, Red Cob, and Marlboro Prolific, each yielding over 72 bu. per acre, while all other varieties yielded much less. Variations in yield were in part due to differences in the growth on the various plats. In a fertilizer test nitrate of soda and cotton-seed meal proved beneficial, but kainit was of no benefit.

Nine varieties of wheat ranged in yield from 2.2 to 10.2 bu. per acre, and the yield of hay from the same varieties from 2,600 to 4,000 lbs. per acre. A top-dressing of

129 lbs. of nitrate of soda per acre on April 1 more than doubled the yield. Winter oats on poor land top-dressed with nitrate of soda were also much benefited.

Twelve varieties of cowpeas were grown and are briefly described. The yields of peas ranged from nothing to over 15 bu. per acre, Whip-poor-will being the leading variety. A yield of 2.6 tons of hay per acre was secured. The value of the cowpea for renovating soils is discussed and directions for curing cowpea hay are given.

The culture of Johnson grass for hay is described and the effect of fertilizers on the crop is reported. The average results from a fertilizer test gave a profit of $3.03 per acre over the check plats. Cultural notes are also given on Bermuda grass, milo maize, and soy beans.

Range investigations in Arizona, D. GRIFFITHS (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 67, pp. 62, pls. 10, dgm. 1*).—This bulletin is a report on further work on range conditions and improvement in cooperation with the Arizona Station (E. S. R., 13, p. 731).

The more recent results upon the small inclosure previously described are here reported, and the description of a large inclosure containing 31,488 acres upon which the range improvement work was begun in 1903 is given. The more important timber and forage plants studied by the author on his trips over the country are noted, and the most troublesome weeds, together with plants injurious to stock, are enumerated and discussed.

It is estimated that in general from 50 to 100 acres of Arizona lands are required to sustain one bovine animal. Johnson grass was observed to thrive in situations receiving annually two or more irrigations by flood waters, and this species is considered best adapted for preventing erosion. Bermuda grass did not seem promising without irrigation. The Valley of the Little Colorado resembles the Valley of the Rio Grande in vegetation, but it furnishes much less forage. Upon the lower southern areas stock feeds on annual weedy plants from February until about May, on shrubby plants from May until in July, and on perennial grasses and many other forage plants during the rest of the summer and the fall. Forage is most abundant during this last period, while from December to February it is very scarce. Winter and spring annuals occur mainly below an altitude of 4,000 ft. and the best pasture lands are quite generally above an altitude of 3,000 ft.

The distribution of the rainfall during the summer is regarded as of greater influence upon the condition of the range than the total annual precipitation. It is believed that the large inclosure furnishes from 150 to 200 lbs. of air-dried feed per acre. Alfilerilla, probably accidently introduced, is one of the most important forage plants of Arizona and is already widely distributed. The introduction of perennial forage plants upon the mesas has so far given very little encouragement, but *Panicum texanum*, an annual, has given promising results and it is believed that annuals with good seed habits will be most successful on the arid mesa lands.

The relative weight of *Pectocarya linearis*, *Lotus humilis*, and *Monolepis nuttalliana*, three characteristic desert annuals, and certain of their reproductive portions is given, and the data show that the weight of seed compared with the total weight of the plants is large. The same character was observed in *Bouteloua aristoides*. The crops cultivated for hay are alfalfa, barley, wheat, and sorghum. Winter barley is commonly grown with the first crop of alfalfa, and in this way the yield of hay is greatly increased.

The author further reports that the feeding grounds for sheep are often 6 miles from water, those of cattle 10 miles away, while horses travel even greater distances. The prairie dog is destructive to the range in the north and northeastern parts of the Territory. The Russian thistle has become widely distributed in the northern part. The creosote bush (*Covillea tridentata*) is given as one of the plants injurious to sheep.

Report of assistant in agrostology, E. E. NELSON (*Wyoming Sta. Rpt. 1904, pp. 64–85, pls. 6*).—The relative weights of hull and kernel of common white oats grown at high altitudes in Wyoming and at lower altitudes in Nebraska were determined. The results show that there is little difference in the percentage of hull but that the Wyoming oats grown under irrigation are heavier than the Nebraska oats produced without irrigation. The thick and firm hull of barley oats was found to weigh more than the hull of the common white kinds. A list of varieties of wheats under test is given.

The grass and forage plant work carried on in cooperation with this Department was begun in 1901 (E. S. R., 15, p. 350). Grass seed sown in the fall of 1902 came up the following spring, but apparently only *Agropyron occidentale*, *A. spicatum*, *Bromus inermis*, and *Eurotia lanata* persisted. In the experience of the station when less than 1 in. of rain fell during each of the months of April, May, and June the grasses did not become established. The native wheat grass and brome grasses were successful at the station when red top and timothy under like conditions failed. A stand was most readily obtained from grasses with large seeds.

In general, the common perennial grasses, whether native or cultivated, and even on cultivated land did not head before the second year. It was observed that the best growth was made when the stand was thin and that all grasses on thick and heavy soil made little growth and did not head well. Notes on 66 grasses and 15 other forage plants tested at Laramie from 1901 to 1903 are given. Sixteen species of saltbushes were grown in 1903 and the results are briefly noted. "The native annuals such as *Atriplex argentea*, *A. philonitra*, and *A. truncata* have been found easy of cultivation, grow quite rank, and yield a large amount of forage on moist alkali land."

Four varieties of field peas, Mexican, White Canadian, Golden Vine, and Green Canadian, were grown on a 20-acre tract. Golden Vine, the earliest, and Mexican matured in August and the other 2 varieties in September.

Grasses and forage plants, H. BENTON (*South Carolina Sta. Bul. 93, pp. 21*).—This bulletin contains discussions based upon experiments and observations by the station during the past 12 years with reference to the culture of cowpeas, hairy or winter vetch, crimson clover, alfalfa, velvet bean, sorghum, Bermuda grass, Johnson grass, orchard grass, Texas blue grass, Kentucky blue grass, German millet, and *Paspalum dilatatum*.

Miscellaneous field crops in New South Wales, G. L. SUTTON and G. M. MCKEOWN (*Agr. Gaz. New South Wales, 15 (1904), No. 11, pp. 1087–1090, 1093–1096, 1102–1106, 1108–1115, 1118–1125, 1129–1133*).—Brief notes are given on the year's work with cereals and forage crops conducted at the Hawkesbury Agricultural College, Bathurst, Coolabah, Wollongbar, Glen Innes, Moree and Pera Bore.

Work in cereal breeding, T. VON WEINZIERL (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 237–258*).—A list is given enumerating breeding experiments carried on by the seed control station at Vienna with rye, wheat, barley, oats, and corn, and culture tests with these crops in addition to flax, tobacco, potatoes, and grasses.

Early and modern methods of breeding cereals, J. HOLMBOE (*Tidsskr. Norske Landbr., 11 (1904), No. 7, pp. 287–311*).—A discussion of the leading general principles underlying the breeding of small grains.—F. W. WOLL.

The system of farming at Aas Agricultural College, Norway, 1860–1902, T. LANDMARK (*Tidsskr. Norske Landbr., 11 (1904), No. 5, pp. 187–229*).—The paper gives a complete history of the system of farming followed at the Agricultural College at Aas for the period given, with statistical data for 1 and 5 year periods with reference to crops, number of farm animals, and milk production. The gross and net income from crops, farm animals, forest, orchard, and workshop is also given.—F. W. WOLL.

The effect of copper sulphate and iron sulphate solutions on agricultural plants, Sachser (*Centbl. Agr. Chem., 33 (1904), No. 8, pp., 533–535*).—Pot experiments and field tests were made with potatoes, oats, and clover, in which the healthy plants were sprayed with solutions of copper sulphate and iron sulphate with beneficial effects.

Alfalfa, W. R. Perkins (*Mississippi Sta. Circ. 18, pp. 8, figs. 2*).—Popular directions are given for the culture of alfalfa under southern conditions.

Lucern and trefoil, D. Finlayson and J. S. Remington (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 3, pp. 8, fig. 1*).—Brief descriptions and cultural notes are given for alfalfa and trefoil.

The testing of corn for seed, A. N. Hume (*Illinois Sta. Bul. 96, pp. 401–416, figs. 6*).—This bulletin discusses the importance of testing seed corn and gives complete directions for performing the work.

The methods of testing with plates and sand, with box and cloth in the form of the Geneva Tester, and with box and blotters, are described in detail. The testing of every ear of seed corn is advocated and experiments were made to determine how much time is required to perform the work of testing each ear in a bushel. In the Geneva Tester 4 kernels from each ear of 9 bu. of seed corn required a total time of 401 minutes, or an average of 45 minutes per bushel; and in sand, 5 bu. required 375 minutes or 75 minutes per bushel. The rate the work was done in the Geneva Tester indicates that one man in 10 hours' time can test seed corn enough for 67 acres, counting 1 bu. of seed for 5 acres.

The inspection of 2 lots of seed corn when 4 kernels were taken from each ear and carefully examined required 44 minutes per bushel, while testing these same lots in the Geneva Tester required only 32 minutes per bushel. The results of testing 18 lots of seed corn obtained from farmers and 19 lots from corn specialists are given in a table. A composite test of the entire lot, as well as a test of each ear, was made. All ears of which any of the 4 kernels removed did not grow were discarded as unfit for seed, and a test was then made of this lot and the remaining good seed ears. The composite test showed a germination of 85.19 per cent, the good ears of 94 per cent, and the discarded ears of 66.11 per cent.

These results indicated that by testing each ear in a lot of seed corn as described "it is possible to determine with accuracy which of those ears have the highest average per cent of germinable kernels."

Experiments with cotton, corn, and oats in 1904, J. F. Duggar and J. M. Richeson (*Alabama Canebrake Sta. Bul. 22, pp. 32*).—Russell and Peerless were the most productive varieties of cotton grown on bottom land, and King and Peterkin on poor upland. On the bottom land the highest value of lint and seed, at 9 cts. a pound and 70 cts. a cwt., respectively, was $60.34 per acre and the lowest on the poor upland, $6.07.

Subsoiling, in general, showed no decided benefit. Deep and shallow plowing for cotton gave inconclusive results. On poor, reddish prairie land 240 lbs. of acid phosphate per acre, given alone and in different combinations with kainit and cotton-seed meal, produced an average increase of 72.5 lbs. of lint; and 200 lbs. of cotton-seed meal, alone or in combination with acid phosphate and kainit, increased the average yield of lint by 47.5 lbs. Kainit proved ineffective, while nitrate of soda, cotton-seed meal, cotton seed, and barnyard manure were profitable on prairie land wherever tested.

Results as to the best time of applying nitrate of soda were indefinite, but its use is advised at the first or second cultivation of corn or cotton. Barnyard manure of good quality lightly covered in the center furrow increased the return from cotton and corn during the first and second years from $2.40 to $6.10 per ton of manure. Working large quantities of corn stover or cotton-seed hulls into the soil was of no marked advantage. On poor red soil basic slag and acid phosphate were equally

effective after a crop of cowpeas. On rich black slough land these fertilizers failed to increase the yield of cotton, but the acid phosphate slightly hastened maturity.

Velvet beans plowed under increased the yield of corn 10.1 bu. per acre. The plowing under of cowpea vines or cowpea stubble also considerably increased the yield. Corn also gave better yields after crops cultivated late in summer than after forage crops sown broadcast. Among the varieties of corn tested Welborn ranked first with a yield of 23.1 bu. per acre. In 1904 a test of different methods of soil preparation was decidedly in favor of 8 ft. beds, but the average results for 2 years show but slight differences.

A number of experiments conducted in 1903 and 1904 show that 200 lbs. of nitrate of soda per acre as a fertilizer application for winter oats gave an average increase of 28.8 bu., and 100 lbs. an increase of 15.5 bu. per acre.

The authors recommend for cotton on gray prairie upland a fertilizer application consisting of 100 lbs. acid phosphate and 100 to 200 lbs. cotton-seed meal, or 50 to 100 lbs. nitrate of soda, and in addition 100 lbs. of kainit if the land is subject to rust; and on red prairie soils 100 to 150 lbs. of acid phosphate and 100 to 150 lbs. of cotton-seed meal, or 50 to 75 lbs. of nitrate of soda. For winter oats 50 to 100 lbs. of nitrate of soda per acre, applied during the first half of March, is recommended.

Tests of varieties of cotton in 1904, J. F. DUGGAR (*Alabama College Sta. Bul. 130, pp. 16*).—Of 38 varieties grown Peterkin, Layton Improved, and Jackson yielded over 600 lbs. of lint per acre, the yields being 628, 620, and 607 lbs. per acre, respectively. Lealand stood at the foot of the list with a yield of 378 lbs.

The average yields of lint per acre as shown by groups of varieties were as follows: Peterkin type, 601 lbs.; King type, 471 lbs.; Semi-cluster group, 468 lbs.; Big Boll type, 466 lbs., and Long Staple group, 400 lbs. The value per acre of the seed at $14 per ton and of the lint at 7 cts. per pound ranged from $31.81 to $50.91, only two varieties—Peterkin and Layton Improved—producing values over $50 per acre. In seed production Allen Long Staple ranked first with 1,120 lbs., and Garrard and Lealand last with 765 lbs. The proportion of lint to seed in the varieties varied from 30.8 per cent in Allen Long Staple to 39.1 per cent in Cook Improved.

A variety test conducted on prairie soil in cooperation with this Department resulted in yields of seed cotton ranging from 500 to 830 lbs. per acre and in yields of lint varying from 154 to 290 lbs. Schley, Peterkin, Drake, Crossland, and Toole, in the order given, produced the highest value of seed and lint. Taking the average yield of 283.5 lbs. of lint of the Peterkin group as 100, the yield of the Big Boll group is represented by 78 and that of the Semi-cluster and Long Staple groups by 69.

In making observations on the relative earliness of varieties at the station it was found that on September 1 King had 82 per cent of the bolls open, being followed in this respect by Mascot with 77 per cent and Meredith with 49 per cent. Willett Red Leaf stood last with only 6 per cent of its bolls open on that date. In the cooperative experiments on the prairie soil the observation was made September 7, when 81 per cent of the bolls of Toole and 66 per cent of those of King were open, all others showing a much smaller percentage.

Cotton culture, R. J. REDDING (*Georgia Sta. Bul. 66, pp. 201-234*).—This bulletin is the annual report on cotton experiments in progress at the station (E. S. R., 14, p. 1060).

In 1904, 24 varieties tested produced an average yield of 551 lbs. of lint and 955 lbs. of seed per acre. In total value of lint and seed Toole Early, Layton Improved, and Peterkin ranked first, the values being $75.28, $75.23, and $75.08 per acre, respectively. Layton Improved stood first in yield of seed cotton, Toole Early in yield of lint, Schley in yield of seed, Moss Improved in percentage of lint, Meredith Big Boll in largeness of boll, Rich Man Pride in smallness of boll, and Greer Improved in earliness.

The average data for the last 11 years indicate that, in general, large bolls, medium maturity, and a high percentage of lint are closely related to the value of lint and seed produced, while the size of the seed has no significance in this connection. Brief notes on the leading varieties under test this season are given and the relative standing of 50 of the 130 varieties, nearly all of which have been tested 3 or more times at the station during the past 15 years, is presented in a table. Notes are also given on selecting a variety and selecting seed in the field.

Moss Improved, a medium-maturing variety, yielded 1,682 lbs. of seed cotton per acre as compared with 1,524 lbs. for Greer Improved, an early variety, and 1,594 lbs. for a mixture of the 2 sorts. The average yield of seed cotton for 7 years for the medium and early varieties and the mixture of the 2 was 1,417, 1,324, and 1,408 lbs. per acre, respectively. In another test Moss Improved and Greer Improved were grown in alternate rows and the yields of the several pickings compared. In the first 2 pickings the early variety yielded 684 lbs. of seed cotton per acre and the late variety only 264 lbs. and in the first 3 pickings the yields were 1,400 and 1,122 lbs., respectively, but in total yield the late variety exceeded the early variety by 378 lbs. per acre.

The average results for the last 10 years show that the best variety in each year yielded 576 lbs. of lint and 974 lbs. of seed, and the poorest 386 lbs. of lint and 836 lbs. of seed per acre.

The nitrogen test was conducted as in previous years. All plats received 372.7 lbs. of acid phosphate and 32.3 lbs. of muriate of potash, while cotton-seed meal was applied in different quantities. The differences in yield were not very marked throughout, but a reduction as the quantity of cotton-seed meal applied became smaller and the nitrogen content of the fertilizer application was reduced from 2.94 to 0.89 per cent was apparent. As the percentage of phosphoric acid and potash increased in the fertilizer application the percentage of total crop obtained in the first and second pickings increased. The results of another fertilizer experiment indicated that liberal applications when bedded on in advance of planting are more effective than when applied with the seed, and also apparently promote earliness.

Growing corn and cotton together in the same rows reduced the yield of seed cotton by 95 lbs. per acre as against a yield of 4.46 bu. of corn. Notes on cotton culture and fertilizer treatment are given in an appendix to the bulletin.

Early cottons, R. L. Bennett (*Texas Sta. Bul. 75, pp. 20, figs. 7*).—The plan and purpose of cotton investigations carried on by the station in cooperation with the Bureau of Plant Industry of this Department are described, and the results obtained in 1904, which was the first season of the work, are reported.

A study of early and late varieties was inconclusive because the seed could not be obtained at the right time. Cotton planted April 9 was attacked by the boll weevil and all fruiting stopped after July 20. This planting yielded about three-fourths of a bale per acre, while a planting made June 8 produced stalks from 4 to 5 ft. high but practically no fiber.

The structure of the cotton plant was studied as the plants developed. It was found that early and late varieties differed in length of joint and in the fruiting capacity of the limbs at the first joints on the main stem. The early varieties had short joints and produced fruit limbs at the first joints on the main stem near the ground, while the late cottons had long joints and were without fruit limbs at the lower joints.

The time elapsing from the appearance of square in leaf axil to bloom and full-grown boll was about the same in late and early and in large and small boll cottons. The large boll varieties required a few days longer for the bolls to dry out and open. There was no apparent difference in the rate of growth of the several cottons, but as the rate differs in individual plants it is stated that rapidity in growth may be

promoted by selecting seed from the largest stalks of the desired type. A definition of an early cotton is given and varietal characters, seed selection and importation, earliness of northern seed, and storm-proof cottons are discussed.

To test the effect of fertilizers on earliness, phosphoric acid, potash, and nitrogen were each applied separately and in combination, in small, medium, and excessive quantities. Acid phosphate and potash or kainit were used at the rate of 100, 200, and 500 lbs. per acre, and nitrogen or sulphate of ammonia at the rate of 250 and 500 lbs. per acre. The mixture was made up of 1 part of kainit, 1½ parts of cotton-seed meal, and 2 parts of acid phosphate, and was applied at the rate of 225 and 600 lbs. per acre. Potash and nitrogen were apparently without effect upon the plants, but acid phosphate caused a rapid growth and greatly increased the yield.

The results indicate that increase in earliness and yield and rapid growth are the result of supplying abundant plant food, and that it is sufficient to furnish the soil with only the lacking elements. After 65 days of growth the plants on the acid phosphate plat were 18 in. high with from 8 to 16 squares to the stalk, while the plants on the nitrogen, potash, and unfertilized plats at this time were only from 6 to 9 in. high, with from 0 to 4 squares per stalk. The yields of the first pickings were largest on the phosphoric acid plat. Notes on the effect and use of fertilizers are given.

Handbook of heath culture, P. Graebner (*Handbuch der Heidekultur. Leipzig: Wilhelm Engelmann, 1904, pp. VIII+296, figs. 48, map 1*).—This book discusses the origin, flora, climatic conditions, soils, and management of heath lands. The different types and classes of heathers, classified according to the predominating species of plants, are described.

Abacá (Manila hemp), H. T. Edwards (*Philippine Dept. Int., Bureau of Agr., Farmers' Bul. 12, pp. 29, pls. 6*).—This bulletin presents the more essential details of the Manila hemp industry, suggests certain lines of improvement demanded by present conditions, and offers elementary information required in establishing a new plantation.

The jute industry considered in relation to its introduction to the Philippines, W. S. Lyon (*Philippine Dept. Int., Bureau Agr., Farmers' Bul. 11, pp. 12*).—This bulletin is a synopsis of the jute industry as practiced in India, with explanations of the possible benefits accruing to Philippine agriculture from the cultivation of the better India varieties.

Solanum commersonii, L. Grandeau (*Jour. Agr. Prat., n. ser., 8 (1904), No. 45, pp. 597, 598*).—A description of the plant, with historical notes, is given.

A culture test of Solanum commersonii, L. Grandeau (*Jour. Agr. Prat., n. ser., 8 (1904), No. 47, pp. 665, 666*).—The seed used consisted of 2 tubers with normal characteristics, 1 tuber with a violet skin, 2 small tubers with the skin slightly greenish in color, and 2 aerial bulblets from plants producing violet-skinned tubers.

The 2 tubers of ordinary type gave a yield of 1.04 kg., the violet tuber yielded 2.57 kg. of tubers which grew in a cluster at the base of the plant, the greenish tubers sent root stalks from 2 to 3 meters in length in every direction and produced 7.72 kg. of tubers of different sizes, and the 2 bulblets gave a yield of 1.31 kg. of good-sized tubers. These results represent heavy yields.

Potatoes at university farm, S. B. Green and H. Cuzner (*Minnesota Sta. Bul. 87, pp. 12*).—A variety test with potatoes is reported and brief notes of the different varieties grown are given. The list included a number of seedlings obtained at the station. The yield ranged from 42.5 to 304 bu. per acre, and the rotten tubers from about 1 to 42.3 per cent.

Varieties of the type of Sir Walter Raleigh and Rural New Yorker showed the greatest rot-resistance. Clay Rose and Seedling No. 49 were the only varieties nearly exempt from rot, while in Commercial and Clinton the rotten tubers amounted to

40 and 42.3 per cent, respectively. Treatment with wet Bordeaux mixture was uniformly beneficial, giving an average increase per acre of 86 bu. of merchantable potatoes. This treatment proved more effective than the use of dry Bordeaux mixture, which gave an increase of only 46 bu.

The cost of 3 or 4 applications of wet Bordeaux mixture varied from \$3 to \$5 per acre, while the cost of treating with dry Bordeaux mixture was much less. A pound of Paris green to 125 gal. of Bordeaux mixture gave satisfactory results in killing potato bugs. Directions for corrosive sublimate and formalin treatment for the prevention of scab are given, and the method of exposing the tubers to full sunlight for several weeks before planting in order to destroy the scab germs is recommended.

The manuring of swedes, potatoes, and mangels, C. B. Jones (*County Councils Cumberland, Durham, and Northumberland, Agr. Dept. Durham Col. Sci., Ann. Rpt. 12 (1903), pp. 35–53*).—Cooperative experiments on the manuring of swedes were conducted to ascertain the special requirements of the crop and to compare different fertilizers.

Phosphoric acid was apparently the most important plant food element, followed by nitrogen and potash in the order mentioned. Superphosphate gave a slightly better average crop than basic slag, but was not as profitable. A mixture of the two substances gave better returns than either used alone. Barnyard manure alone was not so profitable as the use of commercial fertilizers alone, but the two applied together resulted in a loss which was less marked when the commercial fertilizers furnished the 3 essential plant food elements.

The results with potatoes indicated that potash was most needed and that it was best applied in the form of the muriate. Complete applications of commercial fertilizers, whether applied alone or with barnyard manure, are recommended. Experiments conducted with mangels showed that nitrogen was the most important fertilizer ingredient, while phosphoric acid and potash apparently had but little effect.

Description of several types of sugar beets, S. Janasz (*Mitt. Landw. Inst. Univ. Breslau, 2 (1904), No. 5, pp. 913–970, pl. 1*).—The literature on the history and culture of the sugar beet is discussed and some of the more important results obtained by different investigators are given. In addition, the author reports the results of investigations with 25 different types of sugar beets. In studying each type its morphology, anatomy, and physiology were considered. The summary of the results is here given in full.

The fat content of the seed bolls of sugar beets varied in the different types under investigation, but it seemed also to be affected by the environment of the growing plant. The sugar content was not influenced by the content of fat. The reddish coloring of the crown appeared in the first stages of growth and differed in intensity with the different types. Polycotyledonous plants are abnormal and their number, varying with the type, ranges from 0.05 to 0.10 per cent.

In studying the leaf characters of a type it was found that the length of the leaf, inclusive of the petiole, and its maximum width may be readily determined, while data with reference to leaf surface and to life duration of the organ are unreliable. In describing the different leaves it is recommended that they be measured in the order of their appearance and that for the determination of the leaf type only the larger ones be considered. Although it was impossible to ascertain with accuracy the leaf surface active in assimilation, marked differences in the size of the leaf between different types were apparent. The type of leaf from a morphological standpoint can be determined only from an entire field, or at least, a large number of plants growing closely together.

The differences in the types of beets are discernible mainly in luxuriance of growth, density of foliage, curliness of leaf, thickness and coloration of leaf stems, color, thickness, and length of root, and size and shape of the crown. Within the type the

weight of the root varies considerably, but the average weight of the roots of different types is of value in determining comparative yields. The author does not consider the average weight of the root as a definite type characteristic.

The anatomical characters also showed marked differences between individuals and differences between types were likewise observed, but the study is not considered extensive enough to reach definite conclusions with reference to anatomical differences between the types. In studying the subject from a physiological and agricultural standpoint marked differences were found in time of maturity, yield, sugar content, and consumption of plant food. The ash content of the roots is almost in inverse ratio to the sugar content, although this ratio varies with the type. The nitrogen content showed marked differences between types but bore no relation to the sugar content. The distribution of nutrients to the leaves and roots appeared, in general, to vary with the type regardless of whether the same was high or low in sugar.

The author states that between the different types all the characters observed varied very much along the same lines and within wide limits, so that differences can be based only upon data obtained from numerous investigations. The causes to which the differences are due are mainly environment, plant food supply, and individuality. A list of 42 references concludes the article.

The supply of plant food in its relation to variation in plants: Experiments with sugar beets and carrots, E. LAURENT (*Bul. Agr. [Brussels], 19 (1903), No. 5, pp. 630–647, pls. 2*).—Different applications of fertilizers with one plant food element predominating were used and their effect upon variation in the plants was observed for several years.

The results to date indicate that for the production of sugar-beet seed it is advisable to apply heavy applications of phosphoric acid for the reason that this element is necessary in the formation of the embryo and the reserve material, and also tends to produce a higher sugar content in the beet. Sodium chlorid in the soil apparently had the effect of lengthening both carrots and beets and of reducing the diameter of the terminal portion. Where lime, potash, and superphosphate were given the tendency to produce carrots cylindrical and obtuse in form was observed.

Seedling and other canes at Barbados, 1904, J. P. D'ALBUQUERQUE ET AL. (*Imp. Dept. Agr. West Indies, Pamphlet 32, 1904, pp. 73*).—The results obtained with a list of seedling canes in 1904 are briefly described and reported in tables. The seedling B. 208 gave very favorable results on red soils, and B. 147, although giving satisfactory results on certain thin and well-drained soils, did not seem suitable for general cultivation.

Tobacco breeding, A. D. SELBY (*Ohio Sta. Bul. 156, pp. 108–114, pls. 3*).—A preliminary statement concerning work in the selection and crossing of tobacco in relation to new varieties is given, and a description of the methods followed at the station included. Of 30 crosses produced in 1903, 25 were grown in 1904 and of these only 15 will be planted in 1905.

Researches on the fertilizer requirements of tobacco, A. C. GIRARD and E. ROUSSEAUX (*Ann. Sci. Agron., 2. ser., 1904, I, No. 3, pp. 376–471; II, No. 1, pp. 16–47*).—This article is mainly a treatise on tobacco culture with special consideration of the fertilizer requirements.

The total quantity of plant food used by the tobacco crop varies widely with the yield, and the results in this work are based upon 1,000 kg. of dry leaves. It was found that smoking tobacco, owing to the closer planting, removes per hectare nearly twice the quantity of plant food removed by tobacco grown for snuff, but that per ton of dry leaves the quantities of nitrogen and phosphoric acid were about the same, while the quantity of potash was greater in the snuff tobacco.

While the tobacco plant as a whole uses considerable plant food, the crop is not considered very exhaustive, because the amount removed in the leaves is compara-

tively limited. One of the most striking characteristics of the tobacco plant is its very rapid growth, which makes a liberal supply of readily available plant food necessary for its proper development.

Report of the wheat experimentalist, W. FARRER (*Agr. Gaz. New South Wales, 15 (1904), No. 11, pp. 1047-1050*).—Work with wheat was carried on at the experimental farms at Wagga, Bathurst, Coolabah, the Hawkesbury College Farm, and Lambrigg. The test of wheats at Wagga led to the adoption of Belotourka, Kubanka, Macaroni No. 1, and Medeah as varieties suitable for general cultivation.

In the breeding of wheats an effort is made to obtain beardless varieties of macaroni wheats and to reduce the length of straw to facilitate harvesting with the stripper. Beardless varieties have already been secured from a cross between an Indian macaroni variety and *Triticum polonicum*. A large collection of unfixed crossbred wheats has been planted with a view to obtaining bunt-resisting varieties. Considerable attention is also given to macaroni wheats at Coolabah. An entirely rust-resistant variety of wheat is reported by the Hawkesbury College Farm.

Cultivation of wheat in permanent alfalfa fields, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 72, pt. 1, pp. 5*).—A description is here given of a method of growing wheat and alfalfa together at the same time on the dry uplands of North Africa. The method has been tried for several years in Algeria, and is there considered a commercial success.

HORTICULTURE.

American varieties of lettuce, W. W. TRACY, Jr. (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 69, pp. 103, pls. 27*).—An exhaustive study has been made of the varieties of lettuce offered by seedsmen in the United States. A classification of varieties is given with a key to the same, together with descriptions and synonyms of all of the varieties of lettuce so far as known now grown in the United States.

The 445 varieties which have been found listed in seedsmen's catalogues were found to consist of 115 true varieties, the others being synonyms or identical with what is believed to be true varieties. A description is given of each true variety with notes on the history of the same, an account of its present status in the trade, and an estimate of its value. A large number of the varieties are illustrated. The work is based on the results of about seven years' study in which all of the varieties have been grown out of doors, the seed of each variety being obtained where possible from a number of different seedsmen.

A table is given showing the time of maturity of each variety when grown in Washington, D. C., the date of the first appearance of the seed stalk, the weight and diameter of the matured plants. The following list is recommended as containing some of the best varieties for the purposes named:

Home use.—Deacon, Hartford, Bronzed Head, New York, Prize Head, Mignonette, Black-Seeded Simpson, Paris White Cos, California Cream Butter, Iceberg, Tennis Ball Black-Seeded. *Market gardening outdoors.*—Big Boston, Tennis Ball Black-Seeded, Black-Seeded Simpson, Hanson, Reichner, California Cream Butter, Paris White Cos, Mammoth Black-Seeded Butter, Hubbard Market, White Chavigne. *Market gardening under glass.*—Grand Rapids, Crumpled-Leaved, Hothouse, Black-Seeded Simpson, Golden Queen, Meete Forcing, White Star, Hubbard Market, Tennis Ball White-Seeded, Detroit Market Gardener Forcing.

Winter forcing of rhubarb, L. R. HITCHCOCK (*Country Life in America, 7 (1905), No. 4, pp. 402-404, figs. 2*).—An account is given of the winter forcing of rhubarb in a house cellar, with a record of expenses and receipts.

The best results in this work have been secured from roots that have been grown but one summer in the open ground. Older roots have proved less satisfactory.

The roots should be set out in the spring, just as soon as possible after the frost is out of the ground. The author digs the roots in the late fall in clumps and allows them to freeze solid before putting in the cellar.

Generally speaking, the roots begin to produce edible shoots within 5 weeks after they have been put into the cellar, and continue in bearing for about 5 weeks. After the roots are put in place on the floor of the cellar, or on specially made benches, they are thoroughly watered with warm water, the soil being kept moist but never wet. It is easy to water too much. An overabundant supply of water results in light-colored stalks, which are lacking in flavor and texture.

Chayote, the South American apple dumpling. A coming product of southern California, G. H. PAINE (*Pacific Fruit World, 18 (1905), No. 21, p. 13, fig. 1*).—The author gives his experience in growing this vegetable in California. It fruits there very abundantly, and it is believed that it will become one of the staple food products of southern California.

Report of assistant in horticulture, E. E. NELSON (*Wyoming Sta. Rpt. 1904, pp. 52–64, pl. 1*).—An outline is given of the work done during the year, with an account of the yield, with descriptions of a number of varieties of garden peas, radishes, lettuce, and cabbage grown at the station. A list is given of the hardy ornamental shrubs which succeed at the station. Among these may be mentioned lilacs, matrimony vine, roses, yellow flowering currant, honeysuckle, barberry, Siberian pea bush, Siberian pea tree, flowering almond, etc. A number of herbaceous perennials which also succeed at the station are mentioned.

A test was made of 2 varieties of mushrooms, Bohemia and Alaska. During a fruiting period of 62 days the Bohemia mushrooms yielded a total of 223 fruits. The Alaska variety came into fruit 18 days later than the Bohemia, producing 252 mushrooms in 31 days. Not only did the Alaska variety yield more mushrooms than the Bohemia, but the mushrooms were larger, came into bearing later, and made a quicker growth.

Sterilized vegetables (*Gardening, 13 (1905), No. 299, p. 167*).—It is reported that a discovery has recently been made whereby vegetables may be preserved indefinitely by sterilizing them with hot air. Corn, peas, string beans, Lima beans, etc., thus treated "take on a withered form much like cured hay, but when put in cold water will resume their shape and retain their former brittleness and garden flavor."

The absorption of drugs by plants, G. VIAUD (*Rev. Hort. [Paris], 76 (1904), No. 24, pp. 588–590*).—A general discussion is given of the possibility and value of so cultivating and fertilizing plants as to increase their medicinal value.

Influence of greenhouse culture on plants in the vicinity of Paris, J. BÉDÉLIAN (*Rev. Gén. Bot., 16 (1904), Nos. 184, pp. 144–154; 186, pp. 242–248; 187, pp. 265–294; 188, pp. 318–338, pls. 4*).—An illustrated descriptive account is given of variations in the anatomical structure of a number of varieties and species of plants grown outdoors and under glass in the vicinity of Paris.

Fourth report of the Woburn Experimental Fruit Farm, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt. 1904, pp. 99*).—The results are here given of fertilizer experiments with strawberries, gooseberries, raspberries, currants, and apples, which have been carried on at the Woburn Experimental Fruit Farm for 8 or more years, and for a lesser period with some of the fruits at Millbrook, lying near Woburn, but possessing a much more sandy soil.

The surface soil at Woburn consists of a sandy loam, resting on a deep bed of very impervious Oxford clay. Analyses show this soil to be sufficiently rich in all the elements of plant food to be called a fertile soil. It is not, however, the authors state, adapted to fruit growing because of its peculiar physical nature. It contains a large quantity of sand in such a minute state of division that under many climatic conditions it exhibits all the properties of the stiffest clay soil. "After heavy rains the water will stand on the ground for a long time before it can soak away, and when

the soil dries up after such rain it becomes caked and as hard as brick, being quite unworkable under such conditions."

In the following discussion wherever commercial fertilizers were used they were compounded as follows: Potassium sulphate 94 lbs., superphosphate 152 lbs., magnesium sulphate 32 lbs., and sodium nitrate 97 lbs. per acre, respectively. It is believed that such a mixture is probably equivalent to a dressing of 12 tons of manure per acre. This mixture was taken as the normal fertilizer.

Strawberries (pp. 10–26, 91).—Manurial experiments with strawberries at Woburn have been under way now for 7 years. The results secured during the first 3 years have been previously noted (E. S. R., 12, p. 646). The purpose of the work is to test the effect of general manures on the crop, the comparative effect of natural and artificial manures, and the comparative effect of small and large dressings of these manures. London city manure was used at the rate of 12 and 30 tons per acre, respectively, on some plats, and commercial fertilizers equivalent to these amounts on others. Six varieties of strawberries were used.

The detailed results secured in different years show very great irregularities. A variety yielding two or three times as much as another one year might rank as far below it the next. The manured plats in 1899 and 1900 were less prolific than the unmanured plats, while in 1901 and 1902 the reverse was the case. On the whole the use of fertilizers has increased the average yield over the unfertilized plats for the 7 years about 12 per cent.

If only the lighter dressings are considered, the yield is about 25 per cent in excess of that of unfertilized plats. Differentiating the fertilizers themselves, the manured plats gave about 2 per cent heavier yield for the whole period than the plats receiving commercial fertilizers, but lighter applications of fertilizers gave about 10 per cent higher yields than where 30 tons of manure or its equivalent of commercial fertilizers was used. Applying the larger amount of commercial fertilizers in 2 separate applications increased the average yield during the 7 years only about 1 per cent.

During the last 4 years of the experiment it was noticed that the fruit from the manured plats was much superior in size and quality to that from the plats receiving commercial fertilizers and the strawberry plants were more healthy, as shown by the smaller number that died. Not the slightest effect of either London city manure or the commercial fertilizers on the period of ripening or duration of the cropping season could be detected.

Summarizing the results for the whole period the authors state that "it does not appear that artificial manures present any advantages over dung, and in view of the marked superiority in size and quality of berry obtained from the dunged plots, and the smaller mortality suffered by the plants in these plots, we should certainly, at present, give a preference to the use of dung, wherever the economic reasons against its use are not too strong."

The application of liquid manures to strawberries during the swelling of the fruit (pp. 27–34, 91).—This experiment is a continuation of that reported by the authors 4 years ago (E. S. R., 12, p. 645) and deals with the effect of watering strawberries during the month preceding the ripening of the fruit with solutions containing different mineral substances. Each plant received 1 qt. of liquid per week for 4 weeks in succession. The different plats were treated as follows: (1) Nothing, (2) water only, (3) water with 3.3 lbs. ammonium sulphate, (4) water with 4.8 lbs. sodium nitrate, (5) water with 5.8 lbs. potassium nitrate, (6) water with 3.3 lbs. ammonium sulphate and 1.4 lbs. crystallized iron sulphate. Each plat contained 432 plants occupying one twenty-fifth of an acre.

The results obtained during the 8 years in which the experiment has been under way are extremely contradictory; for example, the use of water alone resulted in the lowest yields during the first 4 years, but gave the highest yields during the last 4 years. The potassium nitrate plat, which gave the highest yield during the first

period of 4 years gave the lowest yield during the last period, etc. The application of liquid manurial dressings during the swelling of the fruit had on an average no appreciable effect on the crop, and no evidence was accumulated to show that the use of water alone has any appreciable effect or can be justified, even where it can be applied at reasonable cost.

In this experiment there was a noticeable difference in the effect of the different fertilizers on the plants themselves, as shown by their dried weights at the end of the experiment. The values obtained in the different cases were practically identical, except as regards the nitrated plats, where the mortality was 2 to 6 times greater than in any of the other plats and the average weight of the plants was only about one-half that of those in other plats. The sodium nitrate had a more deleterious effect than the potassium nitrate.

Gooseberries (pp. 35–44, 91, 92).—The manurial experiments with gooseberries have been under way for 8 years, but owing to crop failure and insect pests satisfactory results were secured during only 5 seasons. The work of 3 seasons has already been noted (E. S. R., 12, p. 648). At the time of that report the results which had been obtained were contradictory. Further work has thrown fresh light on the subject, so that definite conclusions may now be drawn.

The fertilizers used on the different plats were (1) nothing, (2) 12 tons London city manure, (3) 30 tons London city manure, (4) commercial fertilizers equivalent to 12 tons London city manure, minerals being applied in November and nitrate in February, (5) commercial fertilizers equivalent to 30 tons of London city manure applied as in (4), and (6) commercial fertilizers equivalent to 30 tons London city manure, the minerals applied partly in November and partly in February and the nitrate in February.

The first season in which results were available all manured plats gave about equal results. The next season those fertilized with commercial fertilizers led, but the third and subsequent seasons the gooseberries on the city-manured plats showed the greatest benefit from the use of fertilizers. At the time of writing the manured bushes were vigorous and healthy, while the unmanured bushes and those fertilized with commercial fertilizers were stunted in growth and practically useless for bearing purposes, the fruit being too small and poor for market. Prunings from manured bushes were 6 to 10.5 times greater than from unmanured plats and about 5.5 times greater than from the plats receiving commercial fertilizers.

The anomalies of the first 3 seasons are thus accounted for: "In the first season the dung had not had time to make its effect felt; in the second year it did so, but its first action was that of promoting growth at the expense of fruiting, and the crops were, therefore, reduced below the level of the other plats; after the first vigor of the tree had been expended in growth the fruit began to benefit by the dung, and the crop were further increased by the increased size of the trees which bore it." The increase from 12 to 30 tons of city manure was not productive of any increase in the fruit yield, the proportion being 136 : 131. There was an increase in wood growth, however, the prunings being in the proportion of 609 : 1,065 from the light and heavily manured plats, respectively.

The experiment is interesting from another standpoint, in showing that gooseberry bushes were almost killed for want of manure on the same soil in which manure was practically without benefit to the strawberry plant. The absence of effect of the commercial fertilizers in the case of gooseberries indicates that the beneficial effect in the case of manure must have been due almost entirely to its action on the physical properties of the soil. Analysis of the soil from the different plats showed that manured plats contained from 2 to 3 per cent more moisture than the unmanured plats or the plats which had received commercial fertilizers.

Stating the matter concisely, "the dunged plats were much superior to the others as regards size and quality of fruit and as regards the growth and vitality of the

bushes. The plats dressed with artificials were but little better than those receiving no dressing, and the bushes in them were quite worn-out and dying at the end of 7 or 8 years. Heavier dressings of manure produced no effect on the crops, but increased the growth of the bushes, especially in the case of dung."

Currants (pp. 45–49, 92).—Satisfactory crops of currants have been obtained for only 5 seasons, although the experiment has been under way for 8 years. The test with currants involved a comparison of 12 and 30 tons per acre, respectively, of London city manure, with equivalent amounts as regards fertilizer constituents of commercial fertilizers. Notice of early work has previously been given (E. S. R., 12, p. 648).

A final summary of the results secured indicates that moderate dressings of city manure and artificials for red and white currants increase the crop about 28 per cent. The city manure had less effect at first, owing to its increasing the wood growth. The commercial fertilizers were least effective at the end of the experiment. The manured plats were much superior to the others as regards size and quality of fruit and growth of bushes. Both the fruit yield and the size of the bushes were considerably increased by the use of 30 tons of city manure over a similar application of 12 tons. The heavier dressing of commercial fertilizers, however, while it increased the size of the bushes slightly, had but little effect on the crops.

Raspberries (pp. 50–52, 92, 93).—The fertilizer experiments with raspberries were similar in character to those noted above with currants. The experiments covered a period of 7 years, but in only 4 seasons were satisfactory crops secured. The average increased yield of the fertilized over the unfertilized plats was 30 per cent. The use of 30 tons of manure per acre resulted in 16 per cent better yields than when but 12 tons were used. The larger dressing of commercial fertilizer, however, decreased the yield. On the whole, the city manure proved 23 per cent better as a fertilizer for raspberries than commercial fertilizers, the fruit being larger and of better quality. The effect of the manures on the growth of canes was not determined.

Apples (pp. 53–90, 93).—Fertilizer experiments with apples have been under way since 1896, during which time records have been obtained for 8 seasons. Details of the plan of the work have been previously noted (E. S. R., 12, p. 749). The treatment of the different plats as regards fertilizers has consisted of a comparison of London city manure with equivalent amounts of commercial fertilizers and of combinations of commercial fertilizers and manure. In some instances where nitrate was used the applications were made in late summer.

An exhaustive account is given of the effect of the different fertilizers on the leaf growth, the growth of trunk and branches, and on the production of fruit. On the whole, "neither moderate nor heavy dressings of dung or artificials, nor of both combined, had any appreciable effect on any feature of the trees, nor on the crops from them. The total effect did not amount to 5 per cent, and even that effect was very doubtful. The only exception was in the case of nitrate applied in the early or late summer, which, in several seasons, produced a good effect [on growth of leaf and tree and size of fruit]. In a lighter and poorer soil [at Millbrook] the results obtained indicate that manures will there have a more positive action."

In discussing the exhaustion of the soil by different fruits, the authors state that in their experiments the wood growth of strawberries, roughly speaking, has amounted to about 5 cwt. per acre per annum, red currants 22 cwt. per acre per annum, and bush apples 48 cwt. per acre per annum. It is thought that the wood growth of gooseberries would be similar to currants and that of raspberries intermediate between currants and strawberries. Some of the final practical conclusions of the authors relative to the whole work are as follows:

"We should not recommend a grower to spend any money in manuring apple trees, especially in heavy and fairly fertile soil, unless he had ascertained by an

actual trial on his own ground, and a trial extending over several years, that such manuring would repay him; with gooseberries we should recommend dunging the greater part of the plantation, and reserving only a small portion for trials with artificial manure and with no manure; with currants, raspberries, and strawberries we should recommend the same experimental treatment as with gooseberries, wherever dung, or some manure containing a considerable proportion of organic matter, were procurable at a moderate cost; in cases where this was not so, the bulk of the plantation might be treated with artificials, and only a small portion reserved for treatment with dung.

"In no case, except for the purpose of trial, should we recommend a heavier dressing than 12 tons per acre, or its equivalent in artificials, and in no case should any conclusions be drawn as to the action of the manures on the strength of less than 3 or 4 years' results."

An experimental shipment of fruit to Winnipeg, J. B. Reynolds (*Ontario Agr. Col. Rev., 17 (1904), No. 3, pp. 153–157, figs. 4*).—Two cars containing mixed fruit—peaches, pears, plums, and grapes—were shipped by freight from St. Catharines to Winnipeg. Express rates on carloads were $2.10 per hundred, while freight rates were about 74 cts. per hundred.

The experiment proved that tender fruits could be carried safely in refrigerator cars by freight to Winnipeg, the time required being 6 to 8 days. Wrapped XXX Crawford peaches in 13-qt. baskets realized 85 to 90 cts. net; XX Crawford netted 70 to 80 cts., and Elbertas 62.5 to 80 cts. These prices were fully equal to those for the best California peaches for the same dates, the larger size of the California peaches being counterbalanced by the superior brightness and color of the Canadian fruits.

Plums did not sell so well in the Winnipeg market. Baskets containing 11 qts. of the Reine Claude variety netted 47 cts., the Yellow Egg variety 54 cts., and the Grand Duke and Glass 48 cts. Grapes netted for the most part 75 cts. to $1.02 per crate of 30 lbs., after deducting all charges and cost of packing.

As to the degree of maturity at which fruit should be picked for shipping to Winnipeg, the best results were secured with all classes of fruit when it had been left on the plant until of full size and characteristic color. It should be picked while still firm, but before the yellow tints, significant of ripeness, have begun to appear. "Peaches and pears that were shipped hard and green reached the market without any perceptible change; those that were semifirm at shipment had become sufficiently mellow to be in good usable condition."

A new apple of rare beauty, W. G. Johnson (*Amer. Agr., 75 (1905), No. 4, p. 79, figs. 2*).—The history is given of an apple which has been grown in the Hudson River Valley for a number of years, but which has not previously been publicly described. It is called the Barringer, after Mrs. J. H. Barringer, daughter of the originator of the fruit.

"In size the fruit runs from medium to large and is unusually attractive. It is yellow, washed with a mixed red, splashed and striped with crimson." It is roundish in form with yellow-colored flesh of fine juicy texture. It is an early winter sort.

A frost-proof orange orchard, T. L. Mead (*Country Life in America, 7 (1905), No. 4, pp. 367–369, 385, 386, figs. 6*).—An account is given of the construction of a shed in Florida to protect oranges from frost. The shed is covered with canvas in cold weather and is heated by a spray of warm artesian water having a natural temperature of about 70°.

Sterility in the Japanese plums, M. B. Waite (*Amer. Agr., 75 (1905), No. 5, p. 112*).—The author states that from experiments carried on recently in his plum orchard Japanese plums are practically self-sterile and require cross-pollination to insure fruitfulness.

"Not only the ordinary common Japanese varieties, such as Abundance, Burbank, Red June, Chabbeau, Agen, etc., are decidedly self-sterile to their own pollen, but

the related variety, the Wickson, a hybrid between the Japanese and *Prunus simonii*." The Japanese varieties are extremely fertile when cross-pollinated with other varieties of their own group or with the native plums and probably most other plums. With these plums, however, as with other fruits, "self-sterility obtains only in a relative degree. Under extremely favorable circumstances, with all conditions just right, doubtless they might be able to set a considerable number of fruits without cross-pollination."

The only safe way, however, in planting out plums is to assume self-sterility, and to plant not more than from 3 to 5 rows of one variety in a solid block, placing the varieties which bloom approximately at the same time alongside each other.

Pickling green olives, J. F. REVALK (*California Fruit Grower, 31 (1905), No. 873, p. 3*).—The author carried on experiments for 3 years in the pickling of green olives. He was able to obtain large, firm, bright, even-colored fruit that kept indefinitely and that could not be told from the genuine Queen olive except by taste. In this respect, however, they were very much inferior to the genuine Queen brand.

The author further studied the matter of pickling green olives in Spain. He found that in the vicinity of Seville the olives are brought in from the groves in baskets, sometimes a distance of a day's journey by rail. They are at once put in cement tanks about 5 ft. square by 4 ft. deep and covered with a solution of caustic soda (3° Baume) and kept immersed for from 6 to 9 hours. The soda solution is then withdrawn and the tank filled with water.

After soaking for 4 to 6 hours longer the fruit is put into casks which are headed up and filled with a brine made of salt and water of 8° strength on the salinometer. They are then rolled out into the open courtyard, bunghole up, where they undergo a kind of fermentation for a couple of weeks. At the end of this time the lye taste has entirely disappeared and the olives are ready for sorting and packing, after which they are again packed in the original casks and covered with a brine of 26°. Practically this same method of pickling was employed by the author with California fruit but with negative results, and he is of the opinion that the fault lies in the fruit rather than in the process.

From the author's observations in Spain and his experience in California he derives the following conclusions: "Queen and Manzanilla olives can be grown in this State, but can not be cured to resemble the Spanish product in flavor. They are not good varieties to pickle ripe. For oil making they are inferior to other varieties grown here."

Strawberry culture in Mississippi, A. B. McKAY (*Mississippi Sta. Circ. 19, pp. 6*).—Popular directions for the culture of strawberries in Mississippi.

The influence of grafting on the composition of grapes, G. CURTEL (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 11, pp. 491–493*).—Data secured in the physical and chemical analyses of grapes of the Pinot variety, grafted on Riparia and also grown on its own roots, and of the Gamay variety, grafted on Solonis and also grown on its own roots, are tabulated and discussed.

An appreciable difference is noticeable in the composition of the wines made from grapes grown on grafted vines and on their own roots. The fruits of the grafted vines were larger and the skin thinner with more abundant pulp; the seeds were less numerous but larger. The juice, while more abundant, was ordinarily more acid and contained a greater quantity of sugar and nitrogenous material, though less rich in phosphates, tannin, and coloring material. The coloring material of the grafted vines was also less stable. Two facts were especially prominent—the unstability of the color and excess of wine oxydase of the grafted Pinot variety, and the greater abundance of nitrogenous material in the must.

The rôle of seeds, pellicles, and stems in wine making, P. PACOTTET (*Rev. Vit., 22 (1904), Nos. 568, pp. 485–488; 571, pp. 581–584, pl. 1*).—Commencing in 1901 and continuing to 1903, experiments were made to determine in each instance the

rôle in the production of wine of such individual factors as the stems of grapes, the seeds, the pellicles, and combinations of 2 or 3 of these factors.

The conclusions reached relative to wine made from the Pinot variety were that when must is fermented with the stems the stems fix in their tissues a notable quantity of coloring material amounting to about 20 per cent of the total; that is, the intensity of the color of the wine is about 80 per cent of what it would be if the stems were omitted from the must. The wines made from grapes picked from the stems are softer than the wines made from the total vintage. The latter, however, have more body and are more fruity, and the herbaceous flavor of the stems totally disappears within a year.

The coloring material of the pellicles is only slightly soluble and that which does dissolve becomes insoluble if it finds in the wine a sufficient quantity of tannin This tannin is obtained from the seeds and the stems and also from the casks after racking. In extraction by heat, at a temperature of 60°, a must is obtained very rich in color but poor in tannin. A part of the coloring material becomes insoluble under the influence of yeasts. Another part is precipitated after fermentation.

In wines fermented with the seeds some tannins are obtained which are peculiarly oxidizable in the air. Grapes grown during excessively dry, warm seasons are especially rich in natural oxidases, and at the first racking the wines made from such grapes have a troubled appearance and take on a chocolate color owing to the oxidation of these tannins. This oxidation ceases after 1 or 2 rackings. Red grapes are sometimes added to fermentation vats to increase the color of the wine. It is believed that the experiments show that this practice would be more effectual if berries without the stems were used.

FORESTRY.

The national forest reserves (*Forestry and Irrig., 10 (1904), No. 11, pp. 520, 521*).—An account is given of the purpose of the establishment of forest reserves, their growth, and the ends which they are expected to conserve.

The Luquillo Forest Reserve, Porto Rico, J. C. GIFFORD (*U. S. Dept. Agr., Bureau of Forestry Bul. 54, pp. 52, pls. 8, map 1*).—After giving a general description showing the location and topography of the Luquillo Forest Reserve in northeastern Porto Rico, the author gives a general description of the climate of the region and of its forests.

The reserve, which was established by proclamation by the President in 1903, contains the principal portion of the forested lands still remaining on the island, but the author points out that to the east of the reservation is still some public land which is forested, and he suggests that this should be added to the reserve.

The various efforts that have been made to utilize the forest products are described and notes given on the other industries of the region, after which notes are given on the effect of grazing, fire, deadenings, timber stealings, etc. The necessity for government control is shown, and the author offers suggestions for the administration of the reserve.

The bulletin contains an appendix in which notes are given on the trees of the Luquillo region. This list, which gives not only the scientific but common names, notes on economic uses, distribution, etc., is by the author and O. W. Barrett, entomologist and botanist of the Porto Rico Station.

The South Mountain Forest Reserve, F. L. BITLER (*Forest Leaves, 9 (1904), No. 12, pp. 187–189*).—A brief description of the South Mountain Forest Reserve in Pennsylvania, which embraces about 50,000 acres. The predominating trees are oak, with some young white pine in the valleys and along the sides of the ridges. This reserve is divided into 3 tracts, each of which is separately described.

Report of the secretary of the Pennsylvania Forestry Association, J. T. ROTHROCK (*Forest Leaves, 9 (1904), No. 12, pp. 181, 182*).—This report, briefly noted previously (E. S. R., 16, p. 472), gives a statement of the condition of the department of forestry up to June 1, 1904, when the author resigned his position as commissioner of forestry.

In 1893 the State of Pennsylvania was not known to own any forest land. Since that time cut-over areas have been secured to be devoted to forestry purposes to the amount of 500,000 acres, and negotiations are in progress for the purchase of about 200,000 acres more, making the present or prospective forest reservation of the State about 700,000 acres.

Notes are given on the management of this area. Through the system devised it has been possible to control the forest fires on the State holdings better than ever before. Nurseries of white pine and black walnut have been established and extensive plantings are expected in the near future.

Notes are given on the establishment of the forest academy at Mont Alto in connection with the forest system of Pennsylvania, and suggestions are made for the carrying out of the forest policy.

The forest work at Mont Alto during 1904, G. H. WIRT (*Forest Leaves, 9 (1904), No. 12, pp. 185–187*).—In this portion of the forest reserve of Pennsylvania nurseries have been successfully established, and there are growing there under different conditions of shade, mulching, etc., 1 and 2 year old seedlings of white and yellow pine, red spruce, Douglas fir, white oak, ash, chestnut, horse-chestnut, catalpas, locust, and a few other species.

It has been usually claimed that the western catalpa is free from insect attack, but the experience at this station has shown that a number of caterpillars attacked the seedlings. For their protection the trees were sprayed several times with Bordeaux mixture to which salt was added. This seemed to protect the seedlings against further injury without any damage to the plants.

About 125,000 seedlings have been heeled in for future planting. Improvement cuttings have been made on 100 acres, from which about 200 cords of fire wood, 400 fence posts, a quantity of fence rails, and a few telephone poles have been removed. The dead wood is being removed from the area so as to diminish the danger from forest fires.

Experiments have been made in planting white pine and western catalpa, both as pure forest and mixed growth, different distances of planting being adopted. Alternate plantings with yellow locust and catalpa are also being made, and in the spring of 1905 further extensions of plantings are contemplated.

Forest planting by Los Angeles, Cal. (*Forestry and Irrig., 10 (1904), No. 11, p. 493*).—According to this publication, the city of Los Angeles has undertaken to plant 3,000 acres of brush land, intending to convert it into a commercial forest.

While this practice is quite common in Europe, it is believed to be the only instance in which a city in the United States is interested in creating a forest. Through cooperation with the Bureau of Forestry plans have been completed by which it is expected to convert the waste land into a productive forest, which will not only pay for its creation and care through the sale of mature timber, but will be a place for recreation for the citizens.

A comprehensive forest law (*Forestry and Irrig., 10 (1904), No. 11, pp. 498–503*).—The text is given of a proposed law for the protection and management of the forest lands within the State of California. This is based on two years' cooperation between the Bureau of Forestry and the board of the State of California. In addition to having features of strictly local application, the general principles are commended for consideration in other States.

Forest administration in British India, 1902–3, S. EARDLEY-WILMOT (*Forest Dept. British India, Rpt. 1902–3, pp. 50, map 1*).—A report is given by the

inspector-general of forests of the Government of India showing the extension and organization of forest areas, management of State forests, and financial returns, with appendixes showing the amount of reserve and leased forests, total forest area, working plans, etc.

Annual report of the state forest administration in South Australia, 1903–4, W. GILL (*South Australia Woods and Forest Dept., Rpt. State Forest Admin., 1903–4, pp. 12, pls. 5*).—A progress report is given of the forest investigations on the reserve and protected areas of South Australia, which amounted in 1904 to 182,074 acres.

During the year reported upon, 13,764 acres were inclosed for planting and natural reforestation, and of the 95,000 trees originally planted 89,000 are reported as living. Brief notes are given on the gratuitous distribution of trees through the department, and a report on the cultivation of the date palm, which shows that in 3 localities about 3,000 trees are living which are the results of plantations begun in 1894.

Report of the forestry branch, New South Wales, 1903, E. MACFARLANE (*New South Wales, Dept. Lands, Rpt. Forestry Branch, 1903, pp. 9, pls. 9*).—The forest area under the supervision of the department amounts to 7,271,100 acres, being an increase of 307,404 acres during the year covered by the report.

A synopsis is given of the work of the field staff and progress made in the establishment of forest nurseries, thinning, planting, etc., and figures presented showing the revenue derived and the imports and exports of timber. Notes are given on the enforcement of the regulations regarding the eradication of the prickly pear.

The black ash, J. T. ROTHROCK (*Forest Leaves, 9 (1904), No. 12, pp. 184, 185, pls. 2*).—An account is given of the black ash (*Fraxinus sambucifolia*), its forest characteristics, and the nature and value of its timber.

The basket willow (*Forestry and Irrig., 10 (1904), No. 10, pp. 455–460, figs. 7*).—Investigations carried on by the Bureau of Forestry on the growth and manufacture of basket willow are described, the information being largely drawn from Bureau of Forestry Bulletin 46 (E. S. R., 16, p. 161).

The formation of lodgepole pine forests, M. L. ERICKSON (*Forestry and Irrig., 10 (1904), No. 11, pp. 503–511, figs. 5*).—The lodgepole pine in typical regions occurs as a pure forest of even stand, the trees being nearly all of the same age. Such forests are comparatively young as a rule, the older lodgepole forest not always being a pure forest. This is due to the dying out of the trees that are overtopped, and the space left is taken up by Engelmann spruce, Alpine fir, and other species. The lodgepole pine is intolerant of shade, especially when young, and very few seedlings are found growing in the dense virgin forest. The fact that it does not come up under dense shade determines very largely the composition of the forest.

The reproduction of the lodgepole pine is closely related with the effect of forest fires. The cones do not open immediately after maturity, but the scales remain closed from 2 to 10 years, or until they are made to open by heat. During this time the ripe seed is protected by the cone scales and seems to lose none of its vitality. Unless the fire is a very severe one, young seedlings of the lodgepole pine spring up abundantly on burned districts, soon covering the ground with a dense growth. There is probably no better species of tree than the lodgepole pine to secure reproduction on burned-over areas.

Studies were made of the rate of production on a number of tracts, and it was found that there was an average of about 15,000 seedlings to the acre. In two sample acres by actual count the seedlings in one case were 17,968, and in another 13,632. Where partial shade occurred the number of seedlings on a number of acres examined ranged from 5,000 to 12,000. The well-known occurrence of the lodgepole pine in what are termed "pole patches" is said to be a direct outcome of the reproduction of the tree on burned-over areas.

Forest fires (*Forestry and Irrig., 10 (1904), No. 11, pp. 532–534, fig. 1*).—A record is given of the forest fires during the month of October, 1904, the damage reported being confined largely to Montana and California. The disastrous fires of Oregon and Washington, reported in the previous month, were checked by heavy rains. The loss in Oregon due to the forest fires during September and October is placed at $8,000,000.

Timber seasoning stations (*Forestry and Irrig., 10 (1904), No. 11, p. 494*).—The Bureau of Forestry has made an agreement to carry on timber seasoning tests in Wisconsin and Michigan in cooperation with two telegraph and telephone companies. The object of the experiments is to determine how many years can be added to the life of poles by proper seasoning. The expense of the experiments will be borne jointly by the Bureau of Forestry and the companies interested, and two railroad companies have agreed to haul the poles to the testing stations without charge for freight.

SEEDS—WEEDS.

Some errors in seed testing, H. Rodewald (*Arb. Deut. Landw. Gesell., 1904, No. 101, pp. IV+117*).—The author reports on some errors in the system of seed testing adopted by the German seed control stations. He has conducted an extended series of experiments to test the rules, and the errors are classed by him as "occasional" or "accidental" and "systematic" or "fundamental." He shows by many examples the effect of a strict application of the rules, and how the errors may be greatly increased by using formulas based on wrong data.

Resistance of certain seed to the action of absolute alcohol, P. Becquerel (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 19, pp. 1179–1181*).—The author reviews the work of Giglioli (E. S. R., 7, p. 406), showing that alfalfa and clover seeds artificially dried retain their germinative power after having been submitted for a long time to the action of absolute alcohol, as well as alcoholic solutions of corrosive sublimate.

The experiments of Giglioli in a modified way have been repeated, the author in this case using wheat, peas, beans, clover, and alfalfa. All the seeds were divided into 4 lots, one of which was imperfectly dried, just as it comes from the granary, but the seed coats were left intact; the second had the seed coats perforated; the third lot was soaked in water for 2 hours, while the fourth lot remained as a check. The 3 lots of seed were kept in absolute alcohol for 8 days, after which they were placed in a germinating chamber and kept at a temperature of 28° C.

After remaining in the germinating chamber 4 days the seeds were examined, and all the wheat, pea, alfalfa, and clover seed whose integuments had remained intact were germinating. The others whose integuments had been perforated or which had been soaked in water were dead. The only exception to this was in the case of the beans, and these the alcohol had penetrated through the hilum, destroying their germinative power.

From the experiments reported it appears that the moist seed coat promotes osmosis and is penetrated by the alcohol. On the contrary, when dried to a certain extent, the seed coat becomes impermeable to any anhydrous liquid, and as a consequence is protected against anhydrous solutions of corrosive sublimate or other poisons and absolute alcohol for an indefinite time.

The permeability of seed coats of certain seeds to gases, P. Becquerel (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 22, pp. 1347–1349*).—Following up the investigations of a number of experimenters on the permeability of the seed coats of certain seeds, the author has devised a means of testing by reduced pressure the permeability of seed coats of peas, beans, lupines, honey locust, etc., to various gases.

At the beginning of the experiment the mercury column, which is a feature of the apparatus, remained at about 750 mm., varying only with the barometric pressure. When the seeds had been prepared and placed for 15 days in the apparatus, there was found to be no diminution in pressure where the seeds were thoroughly dried and where the gas was anhydrous. On the contrary, if the gas was charged with water vapor the seed coats became permeable and the mercury column fell accordingly. After 2 or 3 months the passage of the gas had been sufficient to allow the mercury in the tube to fall to the level of that at the base of the column.

From these experiments it is shown that a dry seed coat is an impassable barrier to dry gases, and may be placed in anhydrous gas for any length of time without injury, the respiratory exchange of the seed being completely suppressed.

The circulation of air in sprouting seed grain, J. L. Jensen (*Ugeskr. Landm., 49 (1904), No. 15, pp. 192–195*).—The author recommends that the grain be sprouted in tall woven baskets of about 3-bu. capacity so as to obtain a good circulation of air, by which considerable quantities of oxygen are supplied and the carbonic acid gas generated and held in the interstices of the grain is readily removed.—F. W. WOLL.

Report of the Seed Control Station and Chemical Laboratory at Molkom, 1903, J. A. Andersson et al. (*Red. Werm. Frökontrollanst., Kem. Lab. och Mjölkkontrollanst. Molkom, 1903, pp. 38*).—A report is given of the activity of the seed control station during 1903, in which time 3,633 analyses of seeds were made, the results of which are shown in tabular form. In addition a brief report is given on the work of the chemical laboratory in relation to the inspection of fertilizers, feeding stuffs, dairy products, etc.

Report of the Göteborg and Bohus Seed Control Station, J. E. Alén (*Red. Göteborgs och Bohus Läns Frökontrollanst., 1902–3, pp. 20*).—A report is given of the activity of the seed control station for the fiscal year ended June 30, 1903, and the usual data regarding the purity, germinative ability, etc., of the different varieties of seeds are shown in tabular form.

Report of the Seed Control Station of Lund for 1903, A. Vilke (*Frökontrollanst. Lund Verks. 1903, pp. 32*).—The results of the seed inspection during the year, covering more than 350,000 kg. of seed, are reported upon. The maximum, minimum, and average purity and germination are shown for the different lots of seed.

Weed studies, L. R. Waldron (*North Dakota Sta. Bul. 62, pp. 439–457, figs. 5*).—The results of studies on buried weed seed and notes on French weed, quack grass, and Canada and sow thistle are given.

In 1899 a quantity of seed was buried at different depths to ascertain the effect of this treatment on their germination. Preliminary reports have been made (E. S. R., 13, p. 358), and in the present publication the results of germination tests made in 1904 are shown. It appears that small weed seeds, such as shepherd's purse, tumbling mustard, etc., in germinating will not ordinarily force their way through 2 in. of soil. French weed or pennycress comes up abundantly through 1 in. of soil, less so through 2 in., and not at all through 3 in.

Seed of foxtail grasses germinates about May 1, and will not germinate in the fall from seed gathered that season. Wild mustard will force its way through 3 in. of soil but not through 5 in., and both wild mustard and French weed seed are not preserved in the soil for a period of years unless covered deeper than 3 in. Great ragweed will come through 5 in. of soil, and usually grows more abundantly the second year than the first year after planting.

The seed of wild buckwheat and wild oats buried for 20 months was practically dead. Shepherd's purse, green foxtail, and great ragweed seeds were dead after being buried 56 months. Wild mustard and French weed seeds retained their germination after having been buried for the same length of time. Seeds buried to a considerable depth, 10 in. or more, seem to preserve their vitality better than those buried less deeply.

The author gives some notes on the French weed (*Thlaspi arvense*), in which it is shown that seed of this weed remaining in pods out of doors over winter is usually dead by spring. Plants with green seed pods plowed under ripen their seeds much quicker than those left above ground. The ripened pods occur on this weed 77 days from sowing and 34 days from flowering. This weed is most injurious when it starts in the fall of the year, being a pernicious plant only as a winter annual. If the seed bed of the grain field is well harrowed before seeding, or if the land is spring plowed, French weed will not be troublesome in grain fields.

Notes are given on the relative aggressiveness of different weeds, the author having planted 800 seeds each of Russian pigweed, tumbling mustard, wild mustard, French weed, false flax, and ball mustard. These were planted May 10, 1904, and on July 1 the wild mustard showed the most abundant leaf surface, with false flax next. On July 19 the plants had attained their maximum size and all were pulled and counted, and the relative aggressiveness determined. The number of plants of each kind produced from the 800 seeds was as follows: False flax 520, wild mustard 356, Russian pigweed 281, ball mustard 195, French weed 24, and tumbling mustard 3. This experiment shows the weakness of some species when in competition with other rapid-growing plants.

Notes are given on the distribution of a number of weeds throughout the State, illustrations showing the root stocks of quack grass, and suggestions for the eradication of thistles.

The combating of weeds, P. Trubenbach (*Fühling's Landw. Ztg., 53 (1904), Nos. 20, pp. 749–756; 21, pp. 798–805*).—The effect of the growth of weeds upon crop production is discussed, and the results of extended investigations are given.

Tables are presented showing the effect of weeds on the reduction of soil temperature and moisture and yields of various crops. The average soil temperature from June 27 to July 2 in areas of beets, potatoes, beans, and maize where weeds were allowed to grow showed a reduction of from 2 to 4° C. through the extra shading and transpiration, as compared with similar areas, where the weeds were kept down by thorough cultivation. The water content of the soil at the same time diminished by an average of about 2 per cent on the weedy plats.

The greatest reduction is noted in the diminished yields attributed to the growth of weeds. In one series of experiments the reduction in the yield of peas, vetches, and beets was from 15 to 20 per cent, while beans, potatoes, and maize were reduced from 45 to 66 per cent. In another series the results were even more striking.

The seed habit of a number of weeds is discussed, the distribution of the seeds in the soil and characteristics of different species of weeds are described, and methods of eradication are suggested. Clean cultivation and rotation of crops are recommended and a number of rotations are outlined.

Destruction of charlock by spraying, R. S. Seton (*Yorkshire Col., Leeds, and Yorkshire Council Agr. Education, [Pamphlet] 30, 1903, pp. 3*).—Charlock is said to be so abundant in parts of England as to make its eradication of great importance. The growth of the weed with fallow crops is not liable to result in seeding the ground, consequently attempts should be made to prevent its seeding in grain crops.

Demonstrations have been carried on in Yorkshire during the past 4 years which have shown that spraying, properly conducted, is both the cheapest and most effective way of dealing with charlock in grain. For the eradication of the weed the author suggests spraying while the plants are young, using either a copper sulphate or iron sulphate solution. The majority of the trials have given the best results where iron sulphate was used. If copper sulphate is used it should be applied at the rate of 12 lbs. to 40 gal. of water, or if iron sulphate is used 60 lbs. to 40 gal. When these solutions are used in these strengths there is no permanent injury to the cereal crop.

Report on charlock spraying, W. BRUCE (*Edinburgh and East of Scotland Col. Agr. Bul. 3, 1904, pp. 10, figs. 2*).—A report is given of experiments carried on in 1902 and 1903 for the eradication of charlock among cereals. The investigations were conducted on 24 farms in different parts of Scotland, 6 acres or more being treated at each center, and in some cases as much as 20 acres being sprayed. The treatment recommended is spraying while the plants are young with a 3 per cent solution of copper sulphate at the rate of 50 gal. per acre. In many cases a single application is all that will be needed, but if the plants have attained considerable size a second may be required. In order to realize the full advantage of the spraying, other methods, such as cultural methods, etc., should be diligently practiced.

Concerning the change of hosts of dodders, F. NOBBE and J. SIMON (*Landw. Vers. Stat., 61 (1904), No. 1–4, pp. 313–317*).—The authors describe experiments made to determine the host plants of a number of species of dodder.

In the first series reported small plats of flax and red, white, and alsike clover were sown, together with seed of a species of dodder known to infest each particular host plant, and also seed of as many of the other species of dodder as were available. In August the plats showed that the flax was strongly attacked by the common flax dodder; the red clover was either wholly free from dodder or only a few plants were to be found, although 8 species of dodder seed had been used; the white clover was strongly attacked by dodder from red clover, from alsike clover, and by *Cuscuta racemosa;* and the alsike clover was attacked by the red clover dodder and by its own common parasite, but not by *C. racemosa* or other species.

In another series of experiments red, white, alsike, and Egyptian clovers were grown as seedlings in pots, and after the plants had attained some growth the authors transferred from filter paper to the pots a number of dodder seedlings, placing them in contact with the clover plants. The red clover became infested to a greater or less extent with *C. chiliana*, *C. racemosa*, *C. epilinum*, and *C. trifolii*, while *C. africana* and dodder from alsike clover failed to become established. *C. trifolii* became established on white clover, while *C. racemosa* failed. Alsike clover was attacked only by *C. trifolii*, and upon the Egyptian clover *C. africana* failed to grow, although the dodder seed had been separated from the Egyptian clover seed.

The germinative ability of dodder seed grown upon host plants other than their usual ones was tested and found to range from 0.66 per cent for *C. trifolii* grown on alsike clover to 100 per cent for *C. epilinum* on the different hosts.

DISEASES OF PLANTS.

Report of the section for plant protection, Hohenheim, 1903, O. KIRCHNER (*Ber. Tät. K. Anst. Pflanzenschutz, Hohenheim, 1903, pp. 19*).—Brief summaries are given of the various diseases of plants observed during the year covered by the report, and brief accounts of the investigations carried on for their control. The diseases are grouped under their appropriate host plants, as cereals, potatoes, forage plants, garden plants, fruit trees, grapes, etc.

The smuts of cereals and means for combating them, O. ROSE (*Inaug. Diss., Univ. Rostock, 1903, pp. 59, pls. 2*).—A review is given of the present status of knowledge relating to the smuts of cereals, and the author describes the various factors favoring or retarding the development of the fungi causing these diseases. The susceptibility of different varieties of cereals to smuts is pointed out, after which the influence of time of seeding, the effect of soil temperatures, fertilizers, etc., are discussed, and the results of experiments for combating smuts are given.

The naked barleys, whether early or late sown, are especially subject to smut, the two-rowed varieties of barley are less subject to disease, while the many-rowed varieties with closely adherent glumes are least subject to smut. No variety of spelt

showed any predisposition to attacks of smut, being less subject to the wheat smut than varieties of spring wheat.

Early sowing of cereals when the soil temperature is low gave in the author's experiments with barley, oats, and spring wheat less smut than late sowings. In a similar manner, less smut will be found on those cereals grown on a cold clay soil than on a loamy soil, and as a rule the greatest amount of disease will be found in cereals grown on sandy humus soils. A high temperature of the soil during the first week after sowing favors the germination of the smut spores and consequently the infection of the cereals. Cereals will germinate and begin their growth at a temperature below that at which the fungus can develop.

The use of excessive quantities of Chile saltpeter tended to delay the development of smuts and also to hasten the appearance of the heads, especially in barley and oats.

In the experiments for combating the diseases the author tested a fungicide known as kreolin. This was employed in ½ and 1 per cent solutions, in which barley, oats, and spring wheat were soaked from 10 to 20 minutes. This treatment successfully prevented the appearance of smut and at the same time protected the seed against birds, worms, etc. The use of kreolin, while rather expensive as compared with some other treatments, is recommended as entirely practicable in the ordinary farm practice.

Notes on infection experiments with various Uredineæ, Miss C. M. Gibson (*New Phytol., 3 (1904), No. 8, pp. 184–191, pls. 2*).—The results of an extensive series of infection experiments are given, the investigation being begun with the inoculation of *Ranunculus ficaria* with uredospores of the chrysanthemum rust. Later other host plants were introduced, and in many cases the germ tubes seemed to penetrate the stomata, but in most instances failed to set up any definite infection. The hyphæ in many cases were found to be destroyed after entering the host, and this is believed to have been due to the poisonous properties of substances secreted by the cells.

Certain varieties of chrysanthemums were found not to be infested with the rust, although growing among plants that were badly rusted, and a number of experiments were conducted with these. An attempt to transfer immunity by grafting failed, the shoots of the resistant variety being as freely infested with the rust as the plants growing upon their own roots.

The effect of temperature on the germination of the spores of chrysanthemum rust is shown, and it is said that the uredospores kept for 71 days in a test tube in a cool room retained about 25 per cent vitality.

Notes on some species of Uromyces frequenting various species of leguminous plants, E. Jordi (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), No. 24–25, pp. 763–795, figs. 7*).—The results of an extended series of inoculation experiments with the different species of Uromyces are shown.

The author used in the first series of experiments forms of *U. fabæ* from *Vicia faba V. cracca, Lathyrus montanus*, and *L. vernus*, inoculating a dozen or more different species of leguminous plants with the spores of the different forms. It was found that certain biological forms existed which were not capable of infecting species that were frequently closely related.

Similar results were obtained in studies of *U. ervi* from the hairy vetch, *U. hedysari obscuri, U. pisi, U. astragali*, and *U. anthyllidis*. The experiments with *U. astragali* are reported at considerable length, and the relationship of this fungus with the æcidial form growing on *Euphorbia cyparissias* is pointed out.

Based upon some biological differences, the author describes *U. euphorbiæ astragali* and *U. euphorbiæ corniculati* as new species.

Investigations on the diseases of sorghum, W. Busse (*Arb. K. Gesundheitsamte, Biol. Abt., 4 (1904), No. 4, pp. 319–426, pls. 2, figs. 12*).—Compiled notes on the results of original observations and experiments on diseases of sorghum are given. The author's investigations were, for the most part, carried on in German East

Africa, and the report is given as a contribution to the pathology and biology of tropical economic plants.

Insect attacks and fungus and bacterial diseases are described, several of them seeming to be closely related. The effect of plant lice (*Aphis sacchari* and *A. adusta*) is described, and the indirect effects they cause as shown by fungus and bacterial diseases are pointed out. The attack of cicadas is noted and a description given of the various smuts that have been observed as attacking sorghum in East Africa. Among the species noted are *Ustilago sorghi*, *U. cruenta*, *U. reiliana*, *Tolyposporium filiferum*, and *T. volkensii*.

An account is given of experiments with *U. cruenta*, showing the influence of various factors on the spread of this smut. Notes are given on a large number of fungi known to occur on sorghum, and in an appendix the author describes the work of stalk borers and also a number of wound diseases which seriously affect the plant.

Investigations on some seedling diseases of beets, L. HILTNER and L. PETERS (*Arb. K. Gesundheitsamte, Biol. Abt., 4 (1904), No. 3, pp. 207–253*).—Some of the diseases to which beet seedlings are subject are described, special attention being paid to those caused by *Phoma betæ*. The influence of soils on the diseases is discussed at length, and the possibility of conveying disease through seed balls is shown.

The results of experiments in treating beet seed with a number of fungicides and fertilizers are given. Among those tested were oxalic acid, malic acid, potassium oxalate, monopotassium phosphate, ammonium carbonate, caustic potash, corrosive sublimate, phosphate and carbonates of lime. The highest percentage of germination and lowest of disease was obtained in the pot experiments where dry carbonate of lime was sprinkled over seed planted in moist sand. Seed so treated were practically free from disease. Following the results of this experiment the lowest percentage of affected seedlings was obtained where phosphate of lime was used in a similar manner.

Investigations on the zonal scab of beets, F. KRÜGER (*Arb. K. Gesundheitsamte, Biol. Abt., 4 (1904), No. 3, pp. 254–318, pl. 1, figs. 9*).—Attention is called to the scab of beets, and its possible relation to the potato scab is discussed. The results of the author's investigations which were made on this form of disease on the beet are given at length.

The scab of the beet seems to occupy a definite part of the root, often completely girdling it, hence the name zonal scab. As in the case of the potato scab, the disease is attributed to a fungus, but the author believes it is not identical with *Oospora scabies* of the potato. Cultures made with the organisms showed constant differences, and the author has separated 6 species of Oospora, 5 of which are described as new.

The sugar content of the diseased beet was found to be lowered almost in direct proportion to the amount of scab observed upon the roots. Numerous methods for combating the disease are reported upon. According to a quoted authority, drainage and cultivation and, under certain conditions, the use of lime will give some relief from the disease. This must be carried on in connection with rather long rotation of crops.

A form of scab due to the attacks of small worms is also described, and a bibliography of the subject is appended.

Tobacco diseases, A. D. SELBY (*Ohio Sta. Bul. 156, pp. 87–107, pls. 5, figs. 3*).—The recent establishment of a station to test some of the tobacco problems in Ohio has led to a consideration of some of the tobacco diseases. The author presents a preliminary report of experimental studies on the mosaic disease, root rot, seed bed rot, broom rape, and curing-house troubles in Ohio.

The mosaic disease, which is one of wide distribution, is described at considerable length and the various theories concerning its cause are briefly reviewed. The disease is quite prevalent in southwestern Ohio tobacco fields, and some preliminary

experiments have been conducted relating to its occurrence and infectious nature. The experiments show that all diseased plants in the plant bed should be removed, and wherever diseased plants are found in the field they should be immediately destroyed. The experiments showed that the disease could be communicated by the experimenter touching a number of diseased plants and in quick succession touching those that showed no evidence of the trouble. This fact shows the importance of the destruction of all infected plants, so that the disease may not be distributed.

Among the parasitic diseases the root rot, due to *Thielavia basicola*, and the bed rot, due to *Rhizoctonia* sp., are described at some length. In addition notes are given on the decay of tobacco seedlings, which is attributed to *Alternaria tenuis*, the Granville tobacco wilt, which it is said has been observed in a few places in Ohio, the leaf blight due to *Cercospora nicotianæ*, white speck and brown spot caused by *Macrosporium* spp., and downy and powdery mildew caused respectively by *Erysiphe communis* and *Phytophthora nicotianæ*. Few of these parasitic diseases have been as yet noted in Ohio.

A brief account is given of the parasitism of the broom rape (*Orobanche ramosa*), which is reported as occurring in tobacco fields in a number of places within the State. A previous account of this parasite has been given in Kentucky Station Bulletin 105 (E. S. R., 15, p 159).

In order to call attention to some of the troubles experienced in the curing house, the author briefly summarizes from various sources descriptions of the pole burn or pole rot and stem rot, both of which are sometimes quite destructive.

Pear scab, R. E. Smith (*California Sta. Bul. 163, pp. 18, figs. 9*).—One of the most serious diseases of the pear in California is the pear scab, and the present bulletin aims to give the results of some observations on the occurrence and treatment of this disease in California, based upon the observations of the author in numerous orchards, together with investigations carried on in cooperation with the experiment station.

After describing the fungus (*Fusicladium pirinum*) and its effect upon the pear, the author takes up the subject of the control and shows that in California the usual recommendations published in bulletins and spray calendars can not be successfully followed. These usually call for spraying just as the buds expand, a second application after the blossoms have fallen, followed by a third about two weeks later. Where these directions have been followed the results have not been entirely satisfactory.

The author has carried on some investigations relative to the time of spraying, and the results of his work are quite instructive. A study was made of the different stages of the pear buds from the time they first began swelling until the blossoms began to open, and it was found that successful spraying should begin in what is termed the second stage of bud development. This is just at the time when the bud scales have separated and the first indication of the young growth appears. Other applications should be made from time to time as necessity demands.

In conjunction with the work for the prevention of the scab the author considers the use of lime, sulphur, and salt for insect enemies, particularly the codling worm. This treatment, followed by the use of Bordeaux mixture, will give a crop of clean fruit in nearly every instance. As a precautionary measure the author suggests the plowing under or burning of all the dead leaves and thorough spraying with lime, sulphur, and salt as late in winter as possible, followed by Bordeaux mixture, two applications to be given while the buds are unfolding and others if needed. Ordinarily the two applications will be found sufficient. If only a single treatment of Bordeaux mixture can be given the earlier spraying of Bordeaux mixture will prove the more effective.

Some pathological and physiological notes on coffee, A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 1904, No. 67, pp. 105, pls. 4; abs. in Bot. Centbl., 96 (1904), No. 40, p. 359*).—The results of a prolonged study of coffee diseases and injuries in Java are given, in which the author notes the injury caused by the insect *Pentatoma plebeia* and injuries due to a large number of fungi, among them *Hemileia vastatrix, Glœosporium coffeanum, Coniothyrium coffeæ,* and *Cercospora coffeicola*. He also describes a destructive disease which is doubtless of fungus origin but which has not yet been fully studied. Notes are also given on a disease causing the falling of the flowers of the coffee, on the variation in the form of fruit, the influence of light on the development of young coffee plants, etc.

Some cacao diseases in Africa, O. APPEL and H. F. STRUNK (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), Nos. 16–18, pp. 551–557, figs. 9; 20–22, pp. 632–637, figs. 4*).—The results of extended studies made by the author at the botanical garden at Victoria, Kamerun, on the diseases of cacao are given. The diseases, due to the following new species, are described: *Diplodina corticola* n. sp., *Rhabdospora theobromæ* n. sp., *Discella cacaoicola* n. sp., *Colletotrichum theobromæ* n. sp., *Piricularia caudata* n. sp., *Corymbomyces albus* n. gen. and sp., *Nectria (Eunectria) camerunensis* n. sp., and *Fusarium theobromæ* n. sp.

A witches' broom disease of cacao in Surinam, F. A. F. C. WENT (*Verhandl. K. Akad. Wetensch. Amsterdam, 2. Sec., 10 (1904), No. 3, pp. 40, pls. 6; abs. in Bot. Centbl., 96 (1904), No. 40, pp. 358, 359*).—A peculiar kind of witches' broom of cacao is described.

The disease appears to attack all parts of the plant, often resulting in the fasciation of the branches and the formation of mummied fruits. The cause of the disease is discussed at length. It is believed to be due to a species of Exoascus, and its affinities with the leaf-curl fungus which attacks many stone fruits are discussed. All evidences of diseased material should be destroyed to prevent the spread of the injury.

A disease of red alder, APPEL (*Naturw. Ztschr. Land- u. Forstw., 2 (1904), No. 8, pp. 313–320, figs. 3*).—A disease of red alder due to *Valsa oxystoma* is described.

A similar disease is known in a number of parts of Europe, where it causes considerable injury locally. In some cases other fungi were associated with the Valsa, and culture experiments with young plants have shown species of Cystospora, Melanconium, and *Cryptospora suffusa*. The occurrence of this last fungus indicates that it is not limited in its choice of host plants. The attack of Valsa is often associated with the injury of insects, especially of *Cryptorhynchus lapathi*.

Leaf rust of Pinus cembra, D. H. C. SCHELLENBERG (*Naturw. Ztschr. Land- u. Forstw., 2 (1904), No. 6, pp. 233–241, figs. 2*).—A description is given of a leaf rust of *Pinus cembra*, which the author believes is due to a fungus identical with that which causes the leaf cast of the white pine. The fungus has been identified as *Peridermium strobi*, and its relation with *Cronartium ribicola* on various species of Ribes as an alternate generation is described.

A form of Nectria on the white pine, G. QUÉRITET (*Ing. Agr. Gembloux, 14 (1904), No. 16, pp. 803–814*).—The occurrence in Belgium of a canker disease of white pine is noted.

The author attributes this disease to a species of Nectria, and discusses the relation of the fungus to *Nectria ditissima, N. cinnabarina,* and *N. cucurbitula*. The parasite seems closely related to *N. ditissima* occurring on the beech tree. The species is believed to be a generalized one which has developed a form on the white pine. The relation between the fungus and certain scale insects is discussed at length.

Definite preventive measures to be adopted against this disease are said to be unknown, but by constantly cutting out the affected parts of the trees the spread of the disease may be held in check.

Carnation diseases, G. F. ATKINSON (*American Florist, 24 (1905), No. 869, pp. 16–24, figs. 33*).—This is reprinted from the *American Florist* of February 23, 1893, and gives extensive descriptive notes on a number of the more common and destructive diseases of carnations.

Among those described are the carnation rust (*Uromyces caryophyllinus*), blight or spot of carnations due to *Septoria dianthi*, carnation anthracnose caused by *Volutella* sp., carnation rosette, and fairy ring spot caused by *Heterosporium echinulatum;* and brief notes are given regarding the Botrytis disease, the injury caused by Cladosporium, etc., and where known suggestions for combating the diseases are made.

A disease of carnations, G. POIRAULT (*Bul. Soc. Nat. Agr. France, 64 (1904), No. 9, pp. 805–808*).—Attention is called to a disease of carnations due to *Fusarium dianthi*, and the varying susceptibility of different varieties is pointed out.

The author has begun a series of experiments by which he hopes to increase the resistance to disease by modifying the conditions of plant nutrition. He notes that a variety of carnation very susceptible to disease was successfully grafted upon the common soap wort (*Saponaria officinalis*) and the carnation grew, bloomed profusely, and remained free from disease throughout the season.

The passion flower as a parasite, E. PÉE-LABY (*Rev. Gén. Bot., 16 (1904), No. 192, pp. 453–457, figs. 3*).—The author reports the parasitic growth of *Passiflora cærulea* on the roots of *Euonymus japonicus*.

The use of neutral copper acetate as a fungicide, E. CHUARD and H. FAES (*Chron. Agr. Canton Vaud, 17 (1904), No. 2, pp. 601–608*).—A preliminary report is given of experiments with neutral copper acetate for preventing downy mildew of grapes.

The experiments were carried on at the viticultural station of Vaud in 1904, and success followed the thorough use of the fungicide. Brief notes are given on the results obtained by a number of grape growers with this fungicide, showing its practicability for use under ordinary conditions of care and application, etc.

ENTOMOLOGY.

Injurious insects of 1904, F. L. WASHBURN (*Ann. Rpt. State Ent. Minnesota, 9 (1904), pp. 197, pls. 2, figs. 177*).—In this report the author presents a special account of the Hessian fly, frit fly, peach-stem maggot, chinch bug, and the Mediterranean flour moth. The last-named pest has caused great losses to millers throughout Minnesota, and particular attention is devoted to a discussion of the remedies. It appears from the author's experiments that the insect may be destroyed in any stage by spraying with liquid CS_2. It is not practical to destroy the eggs by the fumes of CS_2. A suitable method of spraying is described. Numerous other methods have been tried and found ineffective or less desirable. These include the use of sulphur, steam, kerosene, ammonia, hydrocyanic-acid gas, lime, tobacco, high temperature, etc.

A list is given of insects affecting raspberries, blackberries, currants, blueberries, strawberries, grapes, melons, squashes, and cucumbers. A spraying apparatus was devised on the basis of an outfit recommended by Professor Stedman for spraying nursery rows in combating leaf hoppers. The apparatus sprays 4 rows at once. The insect was first observed early in July. At that time kerosene emulsion was used at the rate of 1 part stock emulsion to 12 parts of water. This emulsion killed the young insects but not the adults. Later, a mechanical mixture of kerosene was used with better results. The author also discusses spraying machinery, injury to apples from plum curculio, mottled willow borer, feeding habits of birds, gophers, field mice, moles, woodchucks, rabbits, toads, etc., remedies for garden insects, cottony maple scale, and the fumigation for violet gall fly, grain-plant louse, etc.

Injurious insects of 1904, F. L. WASHBURN (*Minnesota Sta. Bul. 88, pp. 13–197, pls. 2, figs. 177*).—The material of this bulletin has already been abstracted from another source (see above).

The insect record for 1903, C. M. WEED (*New Hampshire Sta. Bul. 115, pp. 172–176; Rpt. 1904, pp. 259–264*).—Attention is called to the distribution of the brown-tail moth in New Hampshire. Brief notes are also presented on a number of fruit and garden insects, including oyster-shell bark-louse, apple aphis, cankerworm, tent caterpillar, plum curculio, cabbage-root maggot, squash bugs, etc.

The increase and spread of injurious insects in North Carolina, D. L. WHITE (*Agr. Education, 6 (1904), No. 5, pp. 75–77*).—Brief notes are given on the conditions which favor the general spread of insect pests, with especial reference to the Hessian fly and San José scale.

Insects pests and spraying, F. SHERMAN, Jr. (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 10, pp. 13–18*).—Brief notes are given on the habits, life history, and means of combating a large number of injurious insects. Directions were also presented for spraying apple trees, potatoes, grapes, and other economic plants.

The monthly bulletin of the division of zoology, H. A. SURFACE (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 7, pp. 195–224*).—Brief notes are given on practical measures for control of injurious insects in November, with especial reference to the use of lime-sulphur compounds and other insecticides in the control of San José scale.

Destroying insects and fungus diseases, O. M. MORRIS (*Oklahoma Sta. Bul. 64, pp. 19*).—The most common insect pests in Oklahoma are stated as being codling moth, tent caterpillars, plum curculio, grape leaf hopper, and grape worm, while the most injurious fungus diseases are apple scab, bitter rot, apple rust, brown rot, blackberry rust, black rot, and anthracnose of grapes.

A number of experiments were made in spraying for the control of these insects and fungus diseases. In spraying for codling moth various arsenicals were used, including Paris green, London purple, and arsenate of lead. All of these are effective, but the combination of Bordeaux mixture and Paris green has the advantage of destroying the codling moth and preventing fungus diseases. The spraying should be applied as soon as the blossoms fall and should be repeated every 2 weeks for 4 times. Two sprayings appeared not to be effective in controlling the codling moth.

A test of dust spraying seemed to show little promise for the use of this method in Oklahoma. When Paris green and Bordeaux mixture were used about 80 per cent of the fruit on treated trees was free from infestation. Notes are given on the methods of control of other insect pests and fungus diseases, and formulas are presented for insecticides and fungicides.

Entomological investigations in Jylland in 1903, N. FRITZ (*Hedeselsk. Tidsskr., 1904, No. 11, pp. 279–281*).—Brief notes are given on the habits and injurious attacks of *Retinia buoliana, Tomicus bidens*, and other injurious insects.

Report of the entomologist, W. W. FROGGATT (*Agr. Gaz. New South Wales, 15 (1904), No. 11, pp. 1031–1034*).—Brief economic and biological notes are presented on the army worm, peach aphis, fig insects, pear slug, bot fly, phylloxera, and the inspection of poultry for insect pests.

Economic entomolgy, H. TRYON (*Queensland Dept. Agr. Rpt. 1903–4, pp. 67–69*).—Brief notes are presented on the insect enemies of deciduous fruit trees, citrus fruits, mango, grapevine, strawberry, cotton, garden crops, cereals, sugar cane, etc. A short account is also given of the importation and distribution of injurious species, together with an account of the value of insectivorous birds and the danger of importation of phylloxera.

The entomological section, C. B. SIMPSON (*Transvaal Agr. Jour., 2 (1904), No. 8, pp. 603, 604*).—A short account is given of fumigation tents, locust destruction, bee-keeping, and insects injurious to cabbage and corn.

The entomological section, C. B. Simpson (*Transvaal Agr. Jour., 3 (1904), No. 9, pp. 146–151, pl. 1, fig. 1*).—Notes are given on the habits and injurious effects of the cottony-cushion scale, locusts, cockchafers, *Bagrada hilaris*, etc. A brief account is also given of orchard fumigation.

Injurious insects, F. Corboz (*Chron. Agr. Canton Vaud, 17 (1904), No. 13, pp. 393–396*).—Brief biological and economic notes are given on codling moth, cabbage worm, *Cheimatobia brumata*, etc.

Methods of combating animals injurious to cultivated plants and domesticated animals, Lécaillon (*Bul. Mens. Off. Renseignements Agr., 3 (1904), June, pp. 663–677*).—Attention is called to the opportunities offered by present agricultural methods for the multiplication of injurious insects and other animals. An account is presented of the methods which have proved most effective in destroying insect pests. The chief insecticides are described and recommendations are made regarding their application.

Insects and pyrethrum powder, E. André (*Rev. Hort., 76 (1904), No. 19, pp. 457, 458*).—Brief notes are given on the value of pyrethrum in combating cabbage worms, plant lice, red spider, mole crickets, ants, etc.

The cotton bollworm, A. L. Quaintance and F. C. Bishopp (*U. S. Dept. Agr., Farmers' Bul. 212, pp. 32, figs. 2*).—The losses from this pest have been greater in recent years than ever before. This is partly due to the lack of interest on the part of the planters in the application of remedies. It has been found that the bollworm and boll weevil may best be controlled by the same methods of improved farm practice. The bollworm is most injurious in the western portion of the cotton belt. In this region too little attention has been given to the selection of the seed for early fruiting. The principal crops grown there are cotton and corn, which are the preferred food plants of the bollworm.

The investigations reported in this bulletin are undertaken to determine the possibility of securing an earlier crop of cotton by determining the value of arsenical poisons and of corn as a trap crop. The production of an earlier crop of cotton may be brought about by the use of early fruiting varieties, early planting, early and thorough cultivation, and the use of fertilizers. These methods were tested on a number of farms in Texas. As a rule, fertilizers appear to have a beneficial effect in hastening the fruiting of the cotton crop. The use of early varieties, however, is of equal importance and thorough cultivation is also a large factor.

On account of the preference of the bollworm for corn, it appears that this plant may be used as a trap crop. For this purpose, however, it should not be planted in belts through the cotton field at the usual time in the spring, but so as to be in silk about August 1. From a study of the egg-laying habits of the moth it is believed that the application of arsenicals will be beneficial if made at the time when the eggs of the August generation begin to hatch.

The Mexican cotton boll weevil, G. W. Herrick (*Mississippi Sta. Circ. 17, pp. 7, figs. 2*).—Brief notes on the origin, appearance, life history, and injurious attacks of this species are presented.

Insects mistaken for the Mexican cotton boll weevil, E. D. Sanderson (*Texas Sta. Bul. 74, pp. 13, pls. 5, figs. 7*).—The cotton boll weevil is described for the purpose of showing the differences between the appearance of this insect and that of various other insects which have been mistaken for it. Among the latter mention is made of *Lixus sylvius*, *Trichobaris texana*, white-pine weevil, *Hylobius pales*, snowy-tree cricket, plum curculio, plum gouger, *Chalcodermus æneus*, *Notoxus calcaratus*, *Drasterius elegans*, and a considerable number of other insects which were found on cotton and other cultivated plants.

The sugar-cane borer, H. Maxwell-Lefroy (*Com. Par. Agr. [Mexico], Circ. 9, pp. 39, figs. 10*).—An account is presented of the habits, life history, distribution, natural enemies, and means of combating *Diatræa saccharalis*.

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Insects injurious to cabbage, H. GARMAN (*Kentucky Sta. Bul. 114, pp. 15-47, figs. 17*).—On account of several reported cases of poisoning from eating sprayed cabbage, the author investigated this subject and found that apparently such poisoning had occurred. It was apparently due to carelessness in handling cabbage, however, since experiments conducted by the author showed that cabbage may be sprayed for the destruction of insects and so treated as not to be harmful to man.

In these experiments Paris green, arsenate of lead, and lime-resin mixture containing Paris green were used as insecticides. In general, 2 sprayings were less effective than 4 applications in destroying cabbage insects. Over a month elapsed after the last spraying before the cabbage was harvested. During this period the outside leaves were eaten to some extent but the injury was of little importance. The outer leaves were removed in the field and the cabbage was eaten by members of the station staff without producing any harm. Chemical analyses showed the poison to be present but in the merest trace. In 1903 a similar test was made when no trace of the poisoning was found.

Detailed descriptive, biological, and economic notes were given on the common cabbage pests of Kentucky. The most important of these are imported cabbage worm, cabbage looper, *Evergestes rimosalis*, cabbage plutella, harlequin cabbage bug, cabbage aphis, and cabbage flea-beetle.

Some common insects injurious to the apple, R. I. SMITH (*Georgia State Bd. Ent. Bul. 13, pp. 19, figs. 7*).—Biological and economic notes on woolly aphis, apple-tree borers, and codling moth, together with directions for sending insects by mail. The remedies most successful against the insect pests discussed are mentioned in each case.

Apple aphis, E. CHUARD and H. FAES (*Chron. Agr. Canton Vaud, 17 (1904), No. 22, pp. 607, 608*).—This insect attacks apple and pear trees as well as a number of related trees. Notes are given on the habits and life history of the pest.

Apple maggot and other insects, EDITH M. PATCH and W. M. MUNSON (*Maine Sta. Bul. 109, pp. 167-184, pls. 3*).—In this bulletin particular attention is given to a description of the apple maggot in its different stages, an account of its life history, and preventive measures which may be adopted in protecting apples against its attacks.

Hogs or sheep in orchards are useful in destroying windfall apples infested with this pest. All other infested fruits should be destroyed or utilized in such a manner as to kill the apple maggots. Brief notes are given on other injurious insects observed during 1904. Among these pests mention may be made of white-marked tussock-moth, brown-tail moth, maple borer, alder blight, gall insects, etc.

The fruit maggot (Trypeta ludens), A. L. HERRERA ET AL. (*Bol. Com. Par. Agr., 1 (1904), No. 1, pp. 30, pls. 5*).—Notes are given on the habits, distribution, life history, and means of combating this pest. The duration of the various stages of the insect are briefly noted. There are believed to be 4 generations per year. The remedies usually recommended for this pest are discussed.

The codling moth in Michigan, R. H. PETTIT (*Michigan Sta. Bul. 222, pp. 77-91, figs. 3*).—The observations reported in this bulletin cover a period of 2 seasons.

The author attempted to obtain evidence regarding the number of broods of the codling moth in Michigan. There appeared to be two, without any good evidence of a third. An examination of infested apples on September 19 showed that about 19 per cent of the larvæ entered at the calyx end of the apple, while in estimates made during the succeeding season from 30 to 35 per cent of the larvæ appear to enter from the side of the apple. The application of Bordeaux mixture containing Paris green at the rate of 4 oz. of Paris green per 40 gal. of water was quite effective.

An examination of apples on July 13 showed only 5 per cent to be infested. Apple scab appeared to be checked somewhat by the treatment. Unsprayed trees examined in the fall showed from 42.5 to 89.3 of the apples to be wormy. Since the

codling moth may pass the winter in storage houses it is recommended that such buildings be fumigated at the rate of 3 lbs. sulphur per 1,000 cu. ft. of space. In addition to insect parasites of the codling moth a fungus disease was observed due to *Isaria farinosa*.

Spray solutions for San José scale, T. B. Symons (*Maryland Sta. Bul. 99, pp. 85–96, figs. 2*).—During the past season tests were made of lime-sulphur-salt wash, caustic-soda and potash solutions, and various proprietary insecticides. Experiments were also carried out to determine the relative value of fall, winter, spring, and summer applications.

The various combinations of lime, sulphur, and salt gave satisfactory results. Boiled solutions were apparently more effective than unboiled. Lime and sulphur wash without salt gave good results in some cases. The addition of caustic soda or potash to the solution seemed to yield a slight advantage. None of the proprietary insecticides, which included San José exterminator, consol, webcide, and kill-o-scale, was of any value.

Experiments in spraying trees, December 11 to 15, showed that the lime-sulphur-salt wash may be successfully used at this season. Spring applications also gave good results, and, on the whole, this seemed to be the most favorable time for spraying. As a result of the author's experiments the only insecticide generally recommended for the control of San José scale is the lime-sulphur-salt wash made in the proportion of 20 lbs. lime, 15 lbs. sulphur, and 10 lbs. salt per 50 gal. of water, and applied in the early spring.

Practical treatment of the San José scale, S. A. Forbes (*Illinois Sta. Circ. 85, pp. 4*).—The experimental work done at the station during the past 4 years has demonstrated that the San José scale may be controlled, or in some instances exterminated, by the use of lime and sulphur sprays.

The greater part of the State is free from San José scale, but it is impossible to prevent it from becoming more widely distributed. The lime and sulphur washes should not be applied while trees are in leaf. The best time for their application is in the late winter or early spring. It is also recommended that all infested Osage orange hedges be destroyed since the San José scale breeds in these hedges, and it is difficult to treat them thoroughly. Detailed suggestions are made regarding the preparation of the Oregon wash and the California wash.

Oscinis frit, A. Carlier (*Ann. Gembloux, 15 (1905), No. 1, pp. 19–24*).—The author describes the great injury which this insect does to oats. The pest is described in its different stages and notes are given on its life history. In combating this pest the author recommends that a suitable system of rotation be adopted in order to prevent the multiplication of the insect.

A new parasite of the eggs of Phlyctænodes sticticalis, K. E. Demokidov (*Russ. Ent. Obozr., 4 (1904), No. 5, pp. 207–209*).—Notes are given on a hymenopterous parasite which lives in the eggs of this insect, and a brief account is also presented of the parasites of the Hessian fly and brown-tail moth.

Tabanidæ of the western United States and Canada, J. S. Hine (*Ohio State Univ. Bul., 8. ser., No. 35; reprinted from Ohio Nat., 5 (1904), pp. 217–248*).—The purpose of this paper is to furnish aid in determining the Tabanidæ of that part of the country which is not well covered by Osten Sacken's work on the diptera. A key is furnished for the identification of the genera and species and a list is given showing the species treated with synonymy and bibliographical references.

Biological notes on species of Liodes, A. Fleischer (*Wiener Ent. Ztg., 23 (1904), No. 9, pp. 251–254*).—Brief notes on the habits and life history of the various species of the Liodes genus.

The palearctic forms of the dipterous genus Lispa, T. Becker (*Ztschr. Ent., n. ser., No. 29, pp. 1–70*).—Descriptive notes are given on a large number of old and new species of the genus Lispa.

The yellow fly of the dismal swamp, N. BANKS (*Ent. News, 15 (1904), No. 9, pp. 290, 291*).—The yellow fly of the dismal swamp was identified as *Diachlorus ferrugatus*. This fly frequently attacks man, causing painful swellings.

Lepidoptera taken in a moth trap at Ditchingham, Suffolk, MRS. H. E. MANN (*Ent. Mo. Mag., 2. ser., 16 (1905), No. 181, pp. 10–13*).—Notes are given on large and small lepidoptera captured in moth traps since 1901. The peculiarities of the trap used in these experiments are briefly described. The variety of species captured was considerable and the author believes that this is a useful device to assist collectors.

Insecticides and fungicides, H. A. GOSSARD and H. H. HUME (*Florida Sta. Bul. 76, pp. 201–250, figs. 28*).—General directions are given for the preparation of various insecticides and fungicides including arsenic bran mash, Criddle mixture, arsenite of lime, Paris green, green arsenoid, London purple, arsenate of lead, white hellebore, whale-oil soap, kerosene emulsion, resin wash, lime-sulphur-soda wash, pyrethrum, tobacco, bisulphid of carbon, hydrocyanic-acid gas, Bordeaux mixture, corrosive sublimate, formalin, etc.

The parasites of Culicidæ, L. DYÉ (*Arch. Par., 9 (1904), No. 1, pp. 5–77, figs. 6*).—The habits of mosquitoes are briefly discussed with reference to the possibility of parasitism from various sources. A brief systematic account is given of the families and genera of the mosquitoes.

Among the internal parasites which are known to affect mosquitoes a number of bacteria and fungi are mentioned including *Empusa culicis*, a bacterial species resembling *Leptothrix buccalis*, etc. Numerous animal parasites also occur in the bodies of mosquitoes in different stages of development. Among these parasites mention is made of species of Nosema, gregarines, hemosporidia, such as the malarial parasite, etc., flagellate infusoria, trematodes, round worms, including various species of Filaria, etc. As external parasites of mosquitoes, mention is made of certain fungi such as the trichophyton infusoria, various species of mites, and diptera. Particular attention is given to a discussion of the parasitic mites of mosquitoes. A brief bibliography of the subject is appended to the article.

Wintering of bees, DEVAUCHELLE (*Apiculteur, 48 (1904), No. 10, pp. 400–403*).—Brief notes on the internal temperature of bee hives during the period of hibernation, and other matters relating to this question.

FOODS—NUTRITION.

Standards of purity for food products (*U. S. Dept. Agr., Office of Secretary, Circ. 13, pp. 14*).—This circular is designed to replace the standards included in a previous publication (E. S. R., 15, p. 702). The form of statement of the standards previously proclaimed has been modified in some cases, and standards for grain products, honey, fermented fruit juices, and vinegar added. The standards fixed for grains and meals follow:

"*Grain* is the fully matured, clean, sound, air-dry seed of wheat, maize, rice, oats, rye, buckwheat, barley, sorghum, millet, or spelt.

"*Meal* is the sound product made by grinding grain.

"*Flour* is the fine, sound product made by bolting wheat meal and contains not more than 13.5 per cent of moisture, not less than 1.25 per cent of nitrogen, not more than 1 per cent of ash, and not more than 0.50 per cent of fiber.

"*Graham flour* is unbolted wheat meal.

"'*Whole wheat flour*,' '*entire wheat flour*,' improperly so-called, is fine wheat meal from which a part of the bran has been removed.

"*Gluten flour* is the product made from flour by the removal of starch and contains not less than 5.6 per cent of nitrogen and not more than 10 per cent of moisture.

"*Maize meal, corn meal*, or *Indian corn meal* is meal made from sound maize grain and contains not more than 14 per cent of moisture, not less than 1.12 per cent of nitrogen, and not more than 1.6 per cent of ash.

"*Rice* is the hulled and polished grain of *Oryza sativa*.

"*Oatmeal* is meal made from hulled oats and contains not more than 8 per cent of moisture, not more than 1.5 per cent of crude fiber, not less than 2.24 per cent of nitrogen, and not more than 2.2 per cent of ash.

"*Rye flour* is the fine sound product made by bolting rye meal and contains not more than 13.5 per cent of moisture, not less than 1.36 per cent of nitrogen, and not more than 1.25 per cent of ash.

"*Buckwheat flour* is bolted buckwheat meal, and contains not more than 12 per cent of moisture, not less than 1.28 per cent of nitrogen, and not more than 1.75 per cent of ash."

On the composition of American noodles and methods for the analysis of noodles, A. L. Winton and E. M. Bailey (*Jour. Amer. Chem. Soc., 27 (1905), No. 2, pp. 137–142*).—Methods of analyzing noodles are discussed and data regarding the analysis of 22 American samples reported. Only 5 of these showed evidence of the presence of eggs. All the samples were artificially colored, in 12 cases with turmeric and in 10 with an azo-color, which was designated as tropeolin. "As the color in the samples containing eggs conveys the impression that greater amounts were used than were actually present, these samples, like the others, must be classed as adulterated."

Ninth report on food products (*Connecticut State Sta. Rpt. 1904, pt. 2, pp. 105–198 + II, pl. 1, figs. 6*).—Data regarding standards of purity for food products are quoted and investigations reported.

Examination of food products sold in Connecticut, A. L. Winton et al. (pp. 119–190).—The following table summarizes data regarding the samples of food and food products examined by the station under the provisions of the State pure-food law in 1904:

Summary of results of examination of food products, 1904.

	Not adulterated.	Adulterated or below standard.	Compounds.	Total number examined.
Sampled by the station.				
Milk	288	28	....	316
Condensed milk	24	4	0	28
Noodles	0	22	0	22
Buckwheat flour	41	16	15	72
Baking powder	50	10	0	60
Cream of tartar	72	19	0	91
Coffee	15	13	0	28
Spices	118	58	1	177
Prepared mustard	4	10	0	14
Catsup and chili sauce	0	81	0	81
Sampled by individuals.				
Milk	170	10	0	180
Cream	16	1	0	17
Spices	6	2	0	8
Miscellaneous	20	6	0	26
Sampled by dairy commissioner.				
Butter	5	0	0	5
Molasses	411	8	0	419
Vinegar	274	....	....	274
Total	1,514	288	16	1,818

A summary of some of the discussions of the analytical data follows: Twenty-eight of the milk samples collected by the station were adulterated by skimming or watering or by the addition of yellow dyes and preservatives, two or more kinds of

adulteration occurring in several of the samples. Nearly 10 per cent of the whole number of samples examined, the authors state, were of inferior quality, which may have been the result of moderate skimming or watering or may have been the fault of the cows or their management. One hundred and one of the samples fell below the United States Government standard in one or more particulars, in some cases possibly owing to a faulty method of taking the sample. Four of the samples of condensed milk examined were deficient in the proportion of milk fat present in the milk solids.

In the case of the baking powders the adulteration found consisted of excessive amounts of calcium sulphate or gypsum. It is stated that during the year no adulterated whole coffee was found on sale, but that ground coffee sold in bulk and in packages was still adulterated, adulteration being especially common with the former. In the case of catsup and chili sauce all the samples examined were found to be adulterated or below the standard. Among the miscellaneous samples submitted to the station for analysis were 6 samples of diabetic flour or similar goods recommended on account of their high gluten content. The amount of this constituent present was found to vary from 9.37 to 54.3 per cent. Data regarding the examination of noodles has been noted from another publication (see p. 895).

The anatomy of the peanut with special reference to its microscopic identification in food products, *A. L. Winton* (pp. 191–198).—The results of an histological study of the peanut are reported, undertaken especially to secure data for use in the microscopical examination of peanut products. According to the author—

"Peanut shells (pericarp) are a normal constituent of peanut cake made from unhulled peanuts and of cattle food made from damaged or immature fruits. They are identified by the pitted hypoderm cells (usually of quadrilateral form) and the various elements of the fiber layer, particularly the T-shaped, the L-shaped, the toothed, and the halberd-shaped forms. The root hairs of the epidermis are difficult to find and the compressed parenchyma cells are not characteristic.

"Products containing only the seed include peanut cake, peanut confectionery, peanut butter (a paste prepared from the seed after removal of the pericarp and testa) and the mixtures of chocolate and peanut cake prepared in Spain and possibly in other countries. These products contain not only the starch, fat, and proteids of the seed, but also, in greater or less amount, the tissues of the testa, of which the porous, sharply polygonal cells of the outer epidermis, and the spongy parenchyma cells, often with narrow arms, are most useful in diagnosis. Fragments of the testa, brown or red on the outer, yellow on the inner, surface, can often be picked out under the dissecting microscope."

Adulterated food products and food studies, E. F. Ladd (*North Dakota Sta. Bul. 63, pp. 461–534*).

Adulterated food products (pp. 461–525).—The scope of the station food inspection work is discussed and data reported regarding the examination of a number of samples which were found to be adulterated or below the standard, including medicines, especially those with a fairly high percentage of alcohol; preserves, jellies, and jams; canned vegetables; maple sirups and sugars; meat and meat products; dried fruits, cocoas, chocolates, beverages, catsups, flavoring extracts, and cream of tartar.

In the case of preserves and similar goods, catsups, and canned goods a marked improvement in quality is noted since the State pure-food law has been in effect. However, the French peas examined were in general found to contain copper or aluminum or both, while the mushrooms in nearly every case were found to be badly bleached and to contain large amounts of sulphurous acid and sulphites. In some instances the can contents consisted almost entirely of mushroom stems, which are usually discarded, and in other cases the mushrooms used were of inferior quality.

The use of preservatives for meat and meat products, especially sausages, Hamburg steak, etc., was found to very widespread in the retail trade, 5 to 15 grains of boric

acid per pound having been found in ham and other cured meat and 20 to 50 grains per pound in sausages, Hamburg steak, etc. The use of sodium sulphite as a preservative was also noted, 0.2 to 0.5 per cent or more of sulphites being apparently used with sausages and Hamburg steak. In the case of potted chicken and turkey it is stated that, although these goods are common in the market, none of the cans examined contained a quantity of chicken or turkey sufficient for determination. Canned salmon was frequently found to contain borates in varying quantity.

Some adulterations and frauds in the food markets (pp. 525-529).—In an address before the International Pure Food Congress and Convention of Dairy and Food Departments at St. Louis the pure-food work of the station was briefly described.

The amount of sodium sulphite recoverable from preserved meats and evaporated fruits, as a basis for the estimation of the amount originally present, C. D. Holley (pp. 530-534).—Tests were undertaken to learn something of the quantity of sodium sulphite added to meat products and whether the preservative can be recovered after the meat has been kept for a time. When 0.2 per cent sodium sulphite was added to pork sausage sulphurous acid equivalent to 36.35 per cent of the preservative was recovered on distilling with phosphoric acid with a sample of sausage which had stood for 6 hours, and 22.66 per cent with a sample which had stood for 3 days. In other words, the proportion of sulphites recovered, the author concludes, is approximately one-fourth of the amount originally present.

The sodium sulphite in a number of samples of meat products was determined and the amount originally added calculated on the assumption that four times the amount recovered would give the minimum quantity originally present. On an average this was found to be 0.5 per cent. Varying amounts of sodium sulphite were added to pork sausage and it was found that 21.75 per cent was recoverable on an average. When 0.2 per cent of sodium sulphite was mixed with pork sausage and the samples allowed to stand 24 and 36 hours, respectively, and then fried, 27.67 and 20.70 per cent of the preservative was recovered. In other words, the author believes that neither standing for a time nor cooking diminishes the quantity of preservative present, as has been sometimes claimed. "The amount of sulphites mixed with meats to preserve them is much larger than is generally supposed."

The amounts of acid remaining in dried fruit which had been bleached with free or combined sulphurous acid was determined in a number of samples and found to be on an average 0.5 per cent, while in one instance as much as 1 per cent was found.

The commercial status of durum wheat, M. A. CARLETON and J. S. CHAMBERLAIN (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 70, pp. 70, pls. 5, fig. 1*).—Information is given regarding the introduction of durum wheat into the United States, its commercial value, origin of the name, and its importance for making macaroni.

The process of manufacture of macaroni is described, the possibilities of the industry discussed, and a list of macaroni manufacturers in the United States is presented. In connection with statements regarding the place of macaroni in the diet a number of receipts for preparing it in various ways are given. Twenty-five analyses, made by the Bureau of Chemistry, of this Department, of alimentary pastes are quoted. From a study of the chemical composition of durum and other flours the following conclusions were drawn:

"The total proteid content of durum wheat flour from wheat grown in Russia and from that grown in this country in normal seasons is considerably higher than that in any of the other principal classes of American wheats.

"In durum wheat grown in the United States in wet and otherwise unfavorable years the proteid content falls to an amount about equal to that of northwestern hard spring wheats or Kansas hard winter wheats, but is above that of the soft winter wheats.

"On the average the proteid content of durum wheat flour grown in 1902 or 1903 is equal to that of northwestern hard spring wheat of the same year, but in flour made from normal wheat grown under more favorable conditions it is higher.

"The amount of gliadin plus glutenin in the flours from the typical wheats studied is in practically the same relation as the total proteids just described.

"The absorption and expansion are, as a rule, greater in the case of flour from durum wheat than of flour from hard spring wheat or hard winter wheat.

"The ash content of durum wheat patent flour is considerably higher than that of hard spring wheat patent flour.

"In general, durum wheat flour differs in composition from hard spring wheat flour in having larger amounts of proteids, ash, and sugar,' but in unfavorable seasons having too much moisture some of these fall to about the same amount as found in the other hard wheats."

Experiments on the use of durum wheat flour for bread making are reported and described. When durum flour was compared with ordinary flour on a commercial scale in a large bakery the results indicated that the 2 flours were very similar and that the durum flour was satisfactory. Brief statements are also made regarding other bakery tests.

From all the bakery tests, it can be said, in the authors' opinion, that durum wheat flour on an average makes as good wheat bread as the average hard spring and hard winter wheat flours. The fact that durum wheat flour is satisfactory for making biscuits, cakes, and other foods is spoken of. As this flour is more or less yellow in color it obviously could not be used for cakes which are desired to be quite white. Its possible use for the manufacture of cereal breakfast foods is also mentioned.

A bread-making test under laboratory conditions, in which durum wheat flour was compared with spring wheat flour, led the authors to conclude that—

"Durum wheat flour produces a bread that, as a rule, contains slightly more moisture and loses this moisture at a slower rate than bread made from hard spring wheat flour.

"The average weight of loaves of equal loaf volume is slightly greater in the case of durum wheat flour than of flour from hard spring wheat.

"The average loaf volume of loaves scaled to the same weight when molded is almost the same with the two kinds of flour.

"Durum wheat flour and the bread made from it contain noticeably larger amounts of sugar than hard spring wheat flour or bread.

"The ash content of durum wheat flour and bread is greater than that of hard spring wheat flour or bread.

"The food value of the two kinds of bread, as measured by the heat of combustion, is practically the same."

Cooperative bakeries, P. Vimeux (*Jour. Agr. Prat., n. ser., 8 (1904), No. 35, pp. 271–273*).—Data regarding the French cooperative bakeries and their operation are summarized.

Notes regarding colonial agriculture, L. Bernegau (*Verhandl. Gesell. Deut. Naturf. u. Aerzte, 1903, II, pp. 118–121; abs. in Chem. Centbl., 75 (1904), II, No. 16, p. 1164*).—The food value of sweet potato flour is spoken of, and analytical data regarding this product are quoted.

Colored mustard, A. Beythien (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 5, pp. 283–285*).—Data are summarized regarding the occurrence of artificial coloring matter in mustard.

Concerning Tunisian olive oil, E. Milliau (*Seifensieder Ztg., 31 (1904), pp. 7, 8, 30, 31; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 585, 586*).—A by-product obtained in olive-oil making called "Margine" is spoken of, as well as the preservation and purification of olive oil.

A study of the chemistry of home-made cider vinegar, L. L. VAN SLYKE (*New York State Sta. Bul. 258, pp. 439-494*).—An extended series of investigations was undertaken to learn why many home-made cider vinegars fail to reach the legal standard of 4.5 per cent acetic acid and 2 per cent cider-vinegar solids.

The work has included the analysis of 122 samples of apple juice, representing 83 varieties of American-grown apples, studies of the changes which apple juice undergoes during alcoholic and acetic acid fermentations, the conditions affecting these changes, and studies of the destructive fermentation which vinegar undergoes on long standing. On an average the apple juice as analyzed had a specific gravity of 1.056 and contained 13.28 per cent solids, 7.41 per cent reducing sugars, 3.28 per cent sucrose, 0.29 per cent ash, and 0.51 per cent fixed acid (malic).

Sugar, the most important constituent in the manufacture of cider vinegar, is, the author states, dependent upon the variety of the apple and the stage of ripeness, unripe or overripe fruit containing less than ripe apples. In the experiments reported apple juice was fermented in casks and bottles under a variety of conditions, some of them approximating those commonly obtaining in the home manufacture of cider vinegar by farmers. Under the ordinary conditions of cellar temperature most of the sugar in the apple juice was changed into alcohol in 5 or 6 months.

In the studies reported the temperature has ranged from 45 to 85° F., and it was found that the alcoholic fermentation has taken place most rapidly at the higher temperatures. Adding yeast to the apple juice hastened alcoholic fermentation. At cellar temperatures the acetic fermentation took place slowly, requiring about 18 months. Under the experimental conditions the formation of acetic acid was most satisfactory at temperatures ranging from 65 to 75° F. The addition of vinegar containing mother to cider after the alcoholic fermentation was completed increased the rapidity of acetic acid formation. When the clear portion of cider was separated from the sediment, the fermentation of acetic acid was apparently favorably affected, especially at lower temperatures.

Several organisms have the power of decomposing dilute acetic acid and thus destroying the value of vinegar. Since these organisms work only in the presence of air, the author points out that this destructive change may be prevented by excluding the air after the acetic acid formation is finished. "In practice this can be done by drawing off the clear vinegar, placing it in a clean barrel, filling it as full as possible, and putting the bung in tight."

It was found that malic acid decreased during the process of vinegar making, in most cases only small amounts, free or combined, being left when the vinegar had become a commercial product. In decomposed vinegars malic acid had entirely disappeared. Malic acid added to apple juice also disappeared rapidly. In sterilized juice the decrease of this constituent was less marked. In the experiments reported all the vinegars gave a precipitate with lead acetate, yet there were some in which not a trace of malic acid was present. The conclusion is reached, therefore, that further study is needed of the relation of malic acid to cider vinegar.

It was found that during the first 3 months of fermentation at cellar temperature the total solids of the vinegar decreased rapidly, but the loss was not uniform in different experiments.

"There is quite generally a decrease of solids to a point below 2 per cent, but under normal conditions there is a subsequent increase. In old vinegars, standing in barrels with the bunghole open, there is evaporation of water and a consequent increase of solids. In vinegars in which a destructive fermentation of acetic acid has occurred, there is also a marked loss of solids. The amount of vinegar solids may be below 2 per cent when the acetic acid is above 4.5 per cent."

As regards vinegar making with respect to legal standards, the author believes that there should be no difficulty in making cider vinegar containing the required 4.5 per cent of acetic acid in 18 to 24 months. If very rapid fermentation is desired the

period of fermentation may be further shortened by adding yeast to the juice in the proportion of 1 cake of compressed yeast to 5 gal. of juice. "In respect to the requirement of 2 per cent of cider-vinegar solids, something depends upon the method of determining solids, since there is as yet no recognized official method. It would be wise for the law to fix the method to be used in estimating solids."

The results of the investigations are summarized and brief directions given for the home manufacture of vinegar.

Making cider vinegar at home, F. H. HALL and L. L. VAN SLYKE (*New York State Sta. Bul. 258, popular ed., pp. 8*).—A popular summary of the above bulletin.

Concerning the adulteration of honey, H. LEY (*Pharm. Ztg., 48 (1903), pp. 603, 604; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, p. 519*).—The feeding of bees, time of year honey is gathered, and other questions are discussed with relation to the character and valuation of honey.

The examination and valuation of honey, G. MARPMANN (*Pharm. Ztg., 48 (1903), p. 1010; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, pp. 518, 519*).—A study of the proteid bodies and ferments of honey.

The making of honey wine, honey liqueur, and honey vinegars, J. GRAFTIAU, trans. by F. BASSLER (*Die Bereitung von Honig-Wein, Met und Honig-Essig. Prague: Deut. Bienenw. Land. Zentralver. Böhmen, 1904, pp. 39, dgm. 1*).—The manufacture of fermented beverages and vinegar from honey is described in detail and a number of receipts are given.

The acetic acid content of Austrian and Italian white and red wines, and of sweet wines in general, B. HAAS (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 11, pp. 775–792*).—Chemical examination was made of a large number of normal Austrian and Italian white and red wines and sweet wines, in order to establish standards with reference to the amount of acetic acid which they may normally contain.

From the results obtained it was concluded that Austrian white wine with more than 1.3 gm. of volatile acid per liter, or with a content of 1.21 to 1.30 gm. volatile acid per liter, and containing less than 20 gm. of dry extract may be designated as acetous. Austrian red wines with more than 1.6 gm. of volatile acid per liter, or Austrian red wines with a content of 1.51 to 1.6 gm. of volatile acid per liter containing less than 20 gm. of dry extract per liter, may also be designated as acetous wines. Common sweet wine, which may contain more than 1.7 gm. of volatile acid per liter, should be designated as acetous. The same rules apply to Italian wines having less than 15 per cent of alcohol as to Austrian wines.

Concerning brandy, K. WINDISCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 8, pp. 465–505*).—Analytical data regarding a large number of samples of different sorts of brandy are reported and discussed. Special attention is also given to analytical methods.

Report on the examination of Ceylon tea, P. DVORKOVITZ (*Year Book Planters' Assoc. Ceylon [Kandy], 1902–3, Rpt. Thirty Com. 1902, pp. 140–147*).—Analyses are reported of 10 samples of Ceylon tea, and the value of tea as part of a diet is discussed.

The author believes that the tannin in the tea increases the oxidation processes of the body, and so exercises a favorable effect in nutrition. He is also of the opinion that the nitrogenous material present in tea is used as food, and that the amount provided is greater than ordinarily supposed. "The consumption of tea forms an important part in the economy of food. It enables those who have to perform specially hard work, either physically or mentally, to take the necessary quantity of food, which, without the assistance of tea, could never be properly consumed."

The occurrence of sulphurous acid in dried fruit and other foods, H. SCHMIDT (*Arb. K. Gesundheitsamte, 21 (1904), pp. 226–284; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 216–219*).—The occurrence of sulphurous acid in normal and sulphured fruits was investigated.

Concerning the excretion of neutral sodium sulphite and aldehyde sodium sulphite by dogs, G. SONNTAG (*Arb. K. Gesundheitsamte, 21 (1904), pp. 285–303; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 219, 220*).

The effect of neutral sodium sulphite, neutral aldehyde and acetone sodium sulphite, and other materials on tadpoles, F. FRANZ (*Arb. K. Gesundheitsamte, 21 (1904), pp. 304–311; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 220, 221*).

Comparative studies of the pharmacological effect of organic compounds of sulphurous acid and of neutral sodium sulphite, E. ROST and F. FRANZ (*Arb. K. Gesundheitsamte, 21 (1904), pp. 312–371; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 221, 222*).—These three articles report work on the pharmacological effect of sulphurous acid and sulphites, as related to food preservatives. In Sonntag's experiments with dogs neither the neutral nor the aldehyde sodium sulphite had any noticeable effect on the total quantity of sulphur excreted in the urine. The greater part of the sulphite taken was oxidized to sulphate before being excreted.

In Franz's experiments with tadpoles all the sulphites tested were poisonous to tadpoles immersed in solutions of different strengths, the acetone sulphite being the most poisonous. Tests were also made with sodium chlorid, nitrate, sulphate, carbonate, bromid, iodid and fluorid, borax, boric acid, and formaldehyde.

In Rost's and Franz's experiments which were made with animals to study the effects of formaldehyde, acetaldehyde, glucose, and acetone sodium sulphite, it was found that these compound sulphurous acid salts behaved like sodium sulphite. In other words, sulphurous acid did not lose its poisonous properties by union with aldehyde, sugar, and acetone.

The art of right living, ELLEN H. RICHARDS (*Boston: Whitcomb & Barrows, 1904, pp. 50*).—The relation of food, exercise, sleep, amusements, environment, etc., to normal healthy life is discussed, the volume as a whole containing many useful suggestions regarding the hygiene of living.

The author points out that while climate is not under our control and habits must be adapted to it, yet food, shelter, and sanitation in the main are under personal control and should receive the attention that they demand. Education in these and related topics is in her opinion of the utmost importance.

The volume is a condensation of lectures given at Knoxville, Tenn., in 1904, before the Summer School of the South.

First lessons in food and diet, ELLEN H. RICHARDS (*Boston: Whitcomb & Barrows, 1904, pp. IV+52, dgm. 1*).—In this introductory text-book the principles of nutrition are plainly stated and some of the more important questions connected with food and diet are taken up. The 10 lessons include such topics as plant life, the school luncheon, daily food, and principles on which bills of fare are made. In each lesson the subjects are discussed in a clear and concise manner and directions are given for the preparation of illustrative material.

Practical dietetics, A. L. BENEDICT (*Chicago: G. P. Engelhard & Co., 1904, pp. 383*).—In this volume, which is especially designed for physicians, the author discusses the chemical basis of dietetics, organic and inorganic food constituents, dietetics in health, foods and condiments, conditions of diet and digestion, dietetics at different periods, as well as dietetics with special reference to different diseases and related questions.

Institution recipes, EMMA SMEDLEY (*Philadelphia: Wm. F. Fell Co., 1904, pp. 121*).—On the basis of personal experience the author gives directions for the preparation of a considerable number of foods and beverages in quantities sufficient to serve 150 persons. Sample menus suitable for institution diet for 1 week, holiday menus, and a week's menus for a lunch room are also given. The author states that "the recipes here offered are the result of personal laboratory experiments and practical application in the preparation of food by groups of students in some departments of the Johns Hopkins Hospital Training School, Baltimore, and the lunch room for students of the Drexel Institute, Philadelphia."

A study of the pulse rate in man as modified by muscular work, W. P. Bowen (*Contributions to Medical Research. Ann Arbor, Mich.: George Wahr, 1903, pp. 462–494, figs. 9*).—A graphic method of recording pulse rate is described and experiments are reported which have to do with the effects of muscular work as shown by changes in pulse rate. Some of the conclusions follow:

"Muscular work is accompanied by a marked acceleration of the pulse, which begins with the next heart cycle after the work begins, and in typical cases shows three well marked stages: A primary rise, a plateau, and a secondary rise. Similar stages of decrease in rate occur after the work stops. . . . The rapidity of the pulse during work depends not only upon the amount of work done but much more upon the manner in which it is done: Speed and resistance are factors requiring separate consideration, and of the two speed has much the greater influence. . . .

"The changes in pulse rate during work and at its end are so sudden and so rapid that the only reliable information concerning them must be acquired while the work is in progress; for this purpose a continuous graphic record is far superior to any other method that has been employed."

Some aspects of the newer physiology of the gastrointestinal canal, L. B. Mendel (*Jour. Amer. Med. Assoc., 43 (1904), No. 21, pp. 1539–1543*).—Recent investigations are summarized and discussed which have to do with the innervation and movements of the alimentary canal, the secretory functions of the glands, and the chemical processes in the alimentary canal. The author's summary regarding the amount of undigested food in feces follows:

"It has been customary to regard the feces as composed primarily of indigestible and undigested food residues. But increasing evidence is pointing to the fact that this is frequently, if not commonly, correct to a small extent only. It is true that coarser foods and substances rich in cellulose pass through the alimentary canal in considerable proportion without utilization. On an ordinary mixed diet, however, the foodstuffs are absorbed remarkably well, and the feces owe their origin in large measure to the waste and secretions of the alimentary tract itself. A diet may thus be feces-forming in proportion to the digestive work which it entails, as well as because of its chemical and physical character, and feces thus resulting must be considered as real metabolic products in distinction from the food residues."

Report on alimentary and urea nitrogen in relation to a maintenance ration, E. Maurel (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 14, pp. 669–673*).—The data summarized regarding the amounts of nitrogen consumed and excreted led the author to conclude that, generally speaking, the nitrogen excreted in the urine is a function of the nitrogen absorbed and within certain limits of the nitrogen ingested.

Under ordinary conditions all the nitrogen of a maintenance ration, with the exception of 0.1 gm. per kilogram normal body weight, is recovered in the urine as urea. The author regards 1.5 gm. nitrogen per kilogram of body weight as the normal amount required for maintenance by an adult in the intermediate seasons in temperate regions.

Approximate estimation of the minimum quantities of lime and magnesia excreted in the urine and the minimum amounts of these substances necessary for a maintenance ration, E. Maurel (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 15, pp. 706–709*).—From his investigations the author drew the conclusion that 0.01 gm. calcium oxid and 0.005 gm. magnesium oxid per kilogram of weight are required for maintenance, amounts which would be contained in the ordinary foods making up a maintenance ration. The quantities of lime and magnesia required by infants and the amounts furnished by mothers' milk and cows' milk are also spoken of, as well as the proportion of these mineral constituents of the diet excreted in the urine.

The minimum amount of phosphoric acid excreted per day and the amount needed for a maintenance ration, E. Maurel (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 16, pp. 751–754*).—Continuing his studies of the constituents of a mainte-

nance ration, the author concludes that 0.04 to 0.05 gm. phosphoric acid per kilogram of weight is necessary for a maintenance ration, an amount which would be supplied by the foods making up an ordinary maintenance ration. A little more than half of the quantity suggested is excreted in the urine. The requirements of infants, as regards phosphoric acid, are also considered.

The minimum amount of sulphur excreted in the urine and the minimum amount required in a maintenance ration, E. Maurel (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 17, pp. 796–798*).—Continuing his investigations, the author studied the sulphur requirements of the body and came to the conclusion that 0.025 to 0.03 gm. per kilogram of weight was sufficient for an adult, which quantities would be furnished in the usual amounts of ordinary foods which would make up a maintenance ration.

The autodigestion of nucleoproteids, W. Jones (*Ztschr. Physiol. Chem., 42 (1904), No. 1–2, pp. 35–54*).—The author studied the products due to the autodigestion of nucleoproteids.

Notes on the hydrolysis of proteids, E. Fischer and E. Abderhalden (*Ztschr. Physiol. Chem., 42 (1904), No. 5–6, pp. 540–544*).—Notes on the hydrolysis of casein and gelatin are reported.

Concerning the formation of sugar from protein and fat in the animal body, E. Pflüger (*Arch. Physiol. [Pflüger], 103 (1904), No. 1–2, pp. 1–66*).—A controversial article.

ANIMAL PRODUCTION.

Commercial feeding stuffs now in the Connecticut market (*Connecticut State Sta. Bul. 147, pp. 55*).—In carrying out the provisions of the State feeding stuff law analyses were made of a number of samples of cotton-seed meal, linseed meal, old and new process, bran, middlings, and mixed feed from winter and spring wheat, corn meal, corn flour, gluten meal and feed, hominy feed, rye feed and bran, malt sprouts, dried distillers' grains, dried brewers' grains, ground oats and feed, buckwheat middlings, provenders and mixed feeds; proprietary horse, dairy stock, and poultry feeds; animal meal and bone for poultry, apple pomace, and dried molasses beet pulp.

In connection with the chemical analyses microscopical examinations were made. In most cases the feeding stuffs were of the required quality. Analyses showed that 2 samples of mixed feeds were spurious since they contained ground corncobs in addition to the wheat products which should make up this class of goods. From a summary of the analytical data obtained during several years regarding winter and spring wheat products the following general conclusions were drawn:

"The spring wheat products, as a rule, have somewhat higher percentages, both of protein and fat, than the winter wheat products.

"This difference is rather more pronounced and constant in the case of middlings than in that of either bran or mixed feed.

"The percentages of protein in bran are rather lower than in either middlings or mixed feed.

"On the average the winter wheat products sell at a slightly higher price than the spring wheat products in spite of the higher protein and fat content of the latter.

"The percentages of protein in all the wheat feeds have been considerably lower in 1904 than in either of the three years immediately preceding. The prices have, however, ruled higher."

As regards apple pomace, the opinion is expressed that this material is "well worth housing and feeding to cattle." The experience of a practical feeder is quoted who has fed it to both horses and cattle with good results.

Inspection of concentrates, J. B. Lindsey (*Massachusetts Sta. Bul. 101, pp. 40*).—Analyses of the following feeding stuffs were made under the provisions of the State feeding stuff law: Cotton-seed meal, linseed meal, old and new process; gluten meal

and feed, dried distillers' grains, malt sprouts, wheat middlings, mixed feeds, wheat feed with admixtures, wheat bran, dairy feeds, molasses feeds, dried molasses beet pulp, oat middlings, rye feed, calf meal, oats, ground barley, corn meal, hominy meal, provenders, corn and oat feed, oat feeds, fortified oat feeds, miscellaneous starchy feeds, meat scraps, meat and bone meal, fish, bone, poultry mash and meal, chick and scratching grains, and clover meal.

Most of the different classes of feeds are discussed. In general they were of satisfactory quality. A sample of wheat feed with admixtures was found which contained a large quantity of ground corncobs, when the label indicated that it contained corn and cob meal. Another sample was found to consist largely of ground wheat screenings, with relatively small amounts of corncobs, oat clippings, wheat bran, and middlings. A tendency to add to mixed feeds inferior shrunken wheat grains, resulting from the ravages of rust, was noted, and consumers are cautioned to be on their guard against such deceptions.

In the case of molasses feeds, the author notes that they are bulky and generally intended to constitute the entire grain ration. "Such feeds should be dry, otherwise they will mold and deteriorate rapidly. Moist, sticky feeds are also unpleasant to handle." The digestibility of concentrated feed, the cost of digestible protein, and related questions are discussed and suitable grain mixtures for feeding are suggested. Data are also given regarding the market value of concentrated feeds.

Digestibility of feeding stuffs by farm animals, together with a brief discussion of the digestive organs and digestibility, M. Müller (*Fühling's Landw. Ztg., 53 (1904), Nos. 2, pp. 66–71; 3, pp. 85–90; 4, pp. 134–144; 5, pp. 179–185*).—The author has summarized and discussed available data on the subject.

The comparative value of organic phosphorus bodies in nutrition, A. Desgrez and A. Zaky (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 31, pp. 392–395*).—Using lecithin, protylin, and nucleic acid, experiments were made with guinea pigs. Rapid gains in weight were noted when the organic combinations of phosphoric acid were taken. In the longest test, the authors call attention to the fact that the influence of lecithin and nucleic acid was less sustained than that of nuclein and protylin.

Water as a nutrient, E. Maurel (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 28, pp. 256–258*).—Experiments which were made with guinea pigs led the author to conclude that a quantity of water which corresponds to the normal amount in the maintenance ration does not cause a permanent increase in body weight, and that consequently water has no value as a nutrient.

White mice fed clover hay with fatal results, P. Gordan (*Landw. Vers. Stat., 60 (1904), No. 1–2, pp. 91–102*).—With a view to determining the cause of the bad results which are sometimes noted when clover hay is fed, experiments with white mice were undertaken. The intensive feeding of this material caused intestinal inflammation and death, but, as the author points out, it does not follow from this that clover should be generally considered as an unsatisfactory feeding stuff.

The conclusion was drawn that generally it is not the presence of injurious constituents, as bacteria or their metabolic products, which gives horses the colic when clover hay is eaten. The fact is rather that this material, even if clean and sweet, is not well tolerated by animals with a sensitive digestive apparatus unsuited to its assimilation. Whether the bad results are dependent upon chemical decomposition of the clover hay in the intestine or to a mechanical effect is still an open question, but the latter supposition seems the more plausible in the light of the available experimental data.

Actual cost of beef making, J. H. Roe (*Breeder's Gaz., 46 (1904), No. 18, pp. 799, 800*).—Data are presented based on the author's personal experience.

Lamb feeding experiments of 1903–4, B. C. Buffum (*Wyoming Sta. Rpt. 1904, pp. 30–38, pls. 3*).—After a preliminary period on alfalfa without and with oats, the

value of field peas and of different rations of alfalfa, roots, and grain was studied with 4 lots of 60 and one of 59 lambs, about one-third of the animals in each lot being small and the remainder large.

The lambs fed field peas were hurdled on small areas, being kept in each place until the crop was eaten as closely as possible without causing lack of feed. The 11.6 acres of peas did not make a full crop, the total yield being 1,380.5 lbs. vines and 737 lbs. seed per acre. The author states that although many of the peas were shelled by tramping over them, yet the bulk were eaten, as the sheep would pick up a large proportion of them.

In the 100 days covered by the test the smallest gain, 18.7 lbs. per head, was made by the lot fed alfalfa, turnips, and oil meal, and the greatest gain, 27.2 lbs. per head, by the lot fed alfalfa, turnips, corn, and oil meal, this being, the author states, the best ration which he could devise. The next greatest gain, 24.9 lbs. per head, was made on the field peas. In the case of peas, 16.48 lbs. was required per pound of gain, and with the ration containing alfalfa and corn 4.52 lbs. alfalfa, 1.79 lbs. turnips, and 2.36 lbs. corn were required per pound of gain.

The author calculates that the smallest amounts of both protein and carbohydrates plus fat were required per pound of gain with the alfalfa and corn ration, and the greatest amounts with the field peas. On the whole the results were favorable to feeding field peas.

"A mistake which is often made in pasturing lambs on peas in the West is that they are allowed to run over the whole field, tramping out and destroying a large part of the feed. This condition puts before the lambs a maximum amount of feed at the first part of the feeding period, when they should be started with a limited supply, and causes them to have the poorest amount of feed and take the most effort to get it in the finishing feeding period, when the food condition should be the best. To prevent this general reversal of the correct order, it is necessary to divide the field by fencing off small portions and turn the lambs into new sections as required."

Market classes and grades of swine, W. Dietrich (*Illinois Sta. Bul. 97, pp. 419–463, figs. 41*).—A thorough understanding of the market classification of pigs, in the author's opinion, is essential; and as a result of investigations in Chicago and other markets in the United States and Canada the following has been prepared:

Classes, subclasses, and grades of hogs.

- Prime heavy hogs (350–500 lbs.)—Prime.
- Butcher hogs:
    - Heavy (280–350 lbs.)—Prime and good.
    - Medium (220–280 lbs.)—Prime, good, and common.
    - Light (180–220 lbs.)—Prime, good, and common.
- Packing hogs:
    - Heavy (300–500 lbs.)—Good, common, and inferior.
    - Medium (250–300 lbs.)—Good, common, and inferior.
    - Mixed (200–280 lbs.)—Good, common, and inferior.
- Light hogs:
    - Bacon—
        - English (160–220 lbs.)—Choice, light, and fat.
        - United States (155–195 lbs.)—Choice, good, and common.
    - Light mixed (150–220 lbs.)—Good, common, and inferior.
    - Light light (125–150 lbs.)—Good, common, and inferior.
- Pigs (60–125 lbs.)—Choice, good, and common.
- Roughs.
- Stags.
- Boars.
- Roasting pigs (15–30 lbs.).
- Feeders.
- Governments.
- Pen holders.
- Dead hogs.

The author groups the last 5 classes under the heading "Miscellaneous."

'Classes and subclasses are divisions into which swine are separated on account of their differences in type, weight, quality, and condition, and the grades distinguish the superior from the inferior animals within the classes and subclasses. The terms 'mediums and butchers,' 'pigs and roughs,' 'selected,' 'shipping,' 'mediums and heavies,' 'mixed,' 'Yorkers,' and 'dairies' are either compound or colloquial terms, and their use should be discouraged."

The characteristics of the different groups are spoken of. Butcher hogs are commonly used for the fresh-meat trade and this class is made up principally of barrows. Packing hogs as a class, the author states, are of poorer quality than the butcher hogs and include some old brood sows "and all other hogs, except the poorer classes, such as roughs, boars, and coarse stags, that are heavy enough for this class and not good enough for the butcher-hog class." Light hogs include all animals within the prescribed weights, except roughs, boars, and stags. Pigs also include all animals within the prescribed weights and are in greatest demand in the winter, being hard to preserve fresh in summer and too young to cure. "Roughs include hogs of all sizes that are coarse, rough, and lacking in condition. . . . Stags are hogs that at one time were boars beyond the pig stage and have been subsequently castrated. . . . Boars are always sold in a class by themselves and bring from two to three dollars per hundredweight less than the best hogs on the market at the same time."

By "governments" is meant all hogs that are not considered sound in every respect and are therefore tagged by the Government inspector and retained for further examination. The term "pen holders" is applied to hogs of little value, which are kept in pens at the stock yards by commission merchants to insure their retaining possession. Dead hogs are those which have been killed in the cars in transit and are used for the manufacture of grease, soap, and fertilizer. As regards the percentage of the different classes in the Chicago market, the author makes the following estimates: Butcher hogs 25, packing hogs 40, light hogs 15, pigs 10, and other classes 10 per cent.

According to the author, "butcher hogs are the best hogs from the fat or lard hog standpoint that come to market, and should be used as a standard for comparison.

"From the bacon-market standpoint the English bacon hog is the ideal toward which hogs are being developed.

"The fat or lard hog is such because corn has been his principal feed, and because there has been a demand for pork from such a hog, and he will conform to the present prevailing type just as long as corn remains his principal feed.

"To the close observer it is apparent that the gradually changing conditions brought about by the development of the United States and the increase in the price of corn, resulting from its varied commercial uses, cause the hog to be fed a more mixed and usually a more nitrogenous ration. This will in the future affect the type of the hog of the United States, so that it will more nearly approach that of the English bacon hog."

The swine industry from the market standpoint, W. DIETRICH (*Illinois Sta. Circ. 83, pp. 8*).—From a discussion of the swine industry a number of general deductions are drawn, including among others the following:

"The fluctuation in the number of hogs in the United States is subject largely to the fluctuations in the financial condition of the country.

"A high market price for hogs stimulates production up to the point where prices are very high and the probability of a lower market seems evident, then it retards production.

"The retailer of meats has considerable influence on the hog market. By holding the retail prices of pork at a high level when the hog market is on the downward trend, he prevents increase in consumption, which, instead of checking, accelerates the downward tendency of the hog market.

"The relative demand for light and heavy hogs changes with the season, heavy hogs being in greater demand in the winter and light hogs in the summer months.

"Owing to the time required to develop a hog, and to the fact that most pigs are farrowed in the spring, the supply of hogs is not in harmony with the demand. Light hogs are the most plentiful in the fall and winter, and heavy hogs during the summer. This is contrary to the demand, and has a depressing influence on the market."

The swine industry in Australia, W. G. McKinney (*Jour. Dept. Agr. West. Australia, 9 (1904), No. 6, pp. 449–455*).—The adaptability of different breeds of swine to local conditions is discussed, together with related topics.

Farm poultry, J. S. Jeffrey (*Bul. North Carolina State Bd. Agr., 25 (1904), No. 9, pp. 3–28, figs. 18*).—Poultry houses and yards, breeds, feeding and management, incubation, parasites, and related topics are discussed.

Poultry and bees (*Queensland Agr. Jour., 14 (1904), No. 3, pp. 179, 180*).—Data are given regarding the poultry and bees kept at the Queensland Agricultural College.

South African experience in the rearing and management of poultry, R. Ulyate (*Agr. Jour. Cape Good Hope, 25 (1904), No. 4, pp. 448–457, figs. 3*).—A discussion of the general subject of poultry breeding, feeding, and related topics.

Extending the poultry industry by traveling teachers and by breeding inspectors, Attinger (*Vrtljschr. Bayer. Landw. Rat., 9 (1904), No. 4, pp. 489–512*).—Existing conditions are spoken of and suggestions for improving the local poultry industry are presented.

The proportion of animal food in the ration for ducklings, W. P. Wheeler (*New York State Sta. Bul. 259, pp. 16*).—Earlier experiments (E. S. R., 11, p. 76) having shown that rations containing animal food give better results than those of apparently equal nutritive value consisting largely or altogether of grain, tests were made to learn how much commercial animal feed could be safely and effectively fed.

In the first test 2 lots were fed a ration in which approximately 0.9 of the dry matter and 98 per cent of the protein were derived from animal sources, the ration being made up of meat meal, animal meal, dried blood, milk albumin, and bone meal with some green alfalfa. The 10 younger ducklings (2 weeks old at the beginning of the test) were fed for approximately 2 months. In the first month the average gain in weight was 27.9 oz., the dry matter eaten per pound of gain 3.2 lbs., and the cost of feed per pound of gain 6 cts. During the last month similar values were 20.3 oz., 7.5 lbs., and 13.7 cts.

The 8 older birds (7 weeks old at the beginning of trial) were fed for 6 weeks. In the first month the average gain per duckling was 42.9 oz., the dry matter eaten per pound of gain 4.1 lbs., and the cost of feed per pound of gain 7.9 cts. During the remaining 2 weeks of the period the average gain per bird was 2.9 oz. Although animal foods made up so large a proportion of the ration no ill effects were noted.

In another test the relative value of different proportions of animal food was studied with 3 lots of 28 and 1 of 27 ducklings 1 week old at the beginning of the test. The rations were made up of different proportions of animal meal, grain mixtures, corn meal, wheat middlings, and green alfalfa. In the case of lot 1 on an average 12 per cent of the dry matter and 20 per cent of the protein of the ration was derived from animal foods, the ash constituents representing 21 per cent of the dry matter. For the whole test which covered 10 weeks the average gain per duckling was 71.7 oz., the dry matter eaten per pound of gain 3.9 lbs., and the cost of feed per pound of gain 5.4 cts.

With lot 2 the animal food furnished about 40 per cent of the protein and 26 per cent of the total dry matter of the ration, the ash constituents representing 24 per cent of the dry matter. The average gain was 78.8 oz., the dry matter eaten per pound of gain 4 lbs., and the cost of feed per pound of gain 6 cts. In the case of lot 3

similar values were 82.7 oz., 4 lbs., and 6.2 cts. The animal food supplied 60 per cent of the protein and 38 per cent of the dry matter of the ration and the ash made up 25 per cent of the dry matter.

With lot 4 the average gain was 78.7 oz., the dry matter eaten per pound of gain and the cost being 4.2 lbs. and 7 cts. The animal food constituted about 80 per cent of the total protein and 59 per cent of the dry matter eaten, 26 per cent of the dry matter being made up of ash constituents.

It was found that, generally speaking, "During the first few weeks growth was more rapid and equal growth made for less food (even at a lower cost for food) under a ration in which 60 per cent of the protein was obtained from animal food than under rations having respectively 20, 40, and 80 per cent of the protein derived from this source.

"Later growth was made at somewhat more economical expenditure of food under the '20 per cent' ration, but was slower. Under the rations containing larger proportions of animal food, marketable size was reached about two weeks sooner.

"Results, on the whole, favored the use for the first few weeks of the ration in which 60 per cent of the protein came from animal food, and later those containing larger and increasing proportions of grain foods."

How much meat shall ducks eat? F. H. Hall and W. P. Wheeler (*New York State Sta. Bul. 259, popular ed., pp. 6.*)—This is a popular edition of the above.

Guinea fowls; pea fowls (*Waterville, N. Y.: Columbia School of Poultry Culture, 1904, pp. 8*).—A concise summary of data regarding the feeding, management, and uses of guinea fowls and pea fowls.

A successful brooder house, F. H. Stoneburn (*Connecticut Storrs Sta. Bul. 33, pp. 10, figs. 7*).—A station brooder house is described, which has proved very successful.

The house is built on a side hill, and its essential feature is an elevated chick floor, which is 3.5 ft. above the level of the alley along the side of the building. This arrangement is secured by taking advantage of the hillside for the level of the chick floor and digging out the space for the alley as much as necessary. If built on the level the author notes that special attention must be paid to securing good drainage in the alley, which would then have to be dug below the surface. The elevated chick floor effects a saving in the amount of heat required to maintain a given temperature, since it diminishes the inclosed air space, which must be heated, and brings the chicks near the ceiling, the warmest part of the room.

Tests have shown that in cold weather the temperature at the level of the alley floor was 14° lower than at the chick floor. By building on a hillside the amount of side wall exposed to the weather is considerably diminished, which is an advantage from the standpoint of heating. The plan followed has a disadvantage in that the chick pens were low, and so it was rather inconvenient for the attendant to enter them when it was necessary.

DAIRY FARMING—DAIRYING.

Cooperative experiments with milch cows, 1903-4, H. Goldschmidt, C. M. Kjeldsen, and J. A. Lemming (*Copenhagen, 1904, pp. 147*).—This is a full account of the second series of feeding experiments with milch cows conducted on Danish dairy farms. (For abstract of the first series, see E. S. R., 16, p. 504.) The aim of the investigations was to determine the effect of feeding different amounts of protein and carbohydrates upon the live weights and the production of milk and butter fat of the cows, and also to ascertain the effect of these variations upon the net profit of production.

The main principle of the system of feeding adopted was to supply the individual cows appropriate rations in proportion to their live weights and milk production. A maintenance ration of 0.7 lb. digestible protein and 7.0 lbs. digestible calculated carbohydrates per 1,000 lbs. live weight was supplied in all cases, and in addition a

ration containing 0.5 lb. digestible protein and 1.3 lbs. digestible calculated carbohydrates per 10 lbs. of milk yielded. The latter productive portion of the rations was varied during the different periods and on the different farms between 0.4 and 0.6 lb. protein and 1.1 and 1.5 lbs. carbohydrates per 10 lbs. of milk.

The experiments here reported were conducted with 3 or 4 lots of cows on each of 7 farms, each lot consisting of 3 or 4 cows. The experiments which were continued for a period of about 6 months included a preliminary period of 15 to 30 days, 2 experimental periods of 60 days each, and a post-experimental period of 10 to 30 days varying on the different farms according to the time of turning the cows out to pasture. The following summary shows the main deductions drawn by the authors from the results of the experiments.

By increasing the normal protein or carbohydrates in the productive portion of the rations, the natural depression in milk production may be checked somewhat, especially at the beginning of the lactation period, but the increase in the production is not sufficient to cover the resulting increased cost of the ration, so that the economy of production is decreased.

By decreasing the normal protein or carbohydrates in the productive portion of the rations a decreased milk production will follow, but while the decrease in the protein tends to increase the net profit obtained, a diminution in the amounts of carbohydrates fed will decrease the same, because the decrease in milk production caused by a diminution of the carbohydrates fed is not accompanied by a decrease in food cost to the same extent as in the case of a diminution in the amounts of protein fed. Since protein is largely supplied in the form of oil cake which must be bought, while carbohydrates are produced on the farm, a reduction in protein below normal can better be justified than a reduction in carbohydrates. A reduction in the allowance of protein is not, however, advisable at the beginning of the lactation period or long before the cows are turned out to pasture.

Individual cows producing most milk or butter fat on a certain amount of feed should preferably be used for breeding. Only by feeding in proportion to live weight and amount of milk produced is it possible to ascertain which individuals in the herd have the best assimilative and productive capacities. For this reason, the authors argue against the group system of collective feeding in studies of the influence of certain feeds or feed rations upon milk production.

A detailed discussion of the arrangement of the system of feeding advocated, under practical farm conditions follows the report proper. Analyses of the feeding stuffs used in the experiments and detailed tabulated data occupy the last 50 pages of the report.—F. W. WOLL.

On the feeding value of dry matter in roots for milch cows, 1899-1901, F. FRIIS (*Ber. K. Vet. Landbohöjskoles Lab. Landökon. Forsög.* [*Copenhagen*], *55* (*1904*), *pp. 140+86*).—This report contains a full account of the thirteenth and fourteenth years' experiments with milch cows conducted by the Copenhagen Experiment Station at Danish dairy farms, according to the plan originally worked out by the late Prof. N. J. Fjord. The general question studied both years was the value of the dry matter of root crops in comparison with grain or oil cakes in rations for dairy cows. The experiments are, therefore, a continuation of the investigations reported in the thirteenth, seventeenth, and twentieth reports of the station (E. S. R., 14, p. 801).

The experiments were conducted on 7 different farms, with 40 cows separated into 4 even lots on each farm. As in the earlier work, the experiments comprised a preliminary period of 40 to 70 days when all cows were fed alike, an experimental period of 60 to 70 days, when the lots were fed different rations, and a post-experimental period when the lots were again fed alike, and so far as possible, the same as during the preliminary period. During the experiment proper 2 lots (A and C) were fed a basal ration containing a very small amount of oil cake (1 lb.), and in addition, lot A received 3 lbs. of grain and lot C a similar amount of dry

matter in mangolds or other roots ("root-dry matter"). Two other lots, B and D, received a large allowance of oil cake (4 lbs.), lot B receiving in addition 3 lbs. of grain, and lot D 3 lbs. of root-dry matter.

The details of the system of feeding varied considerably on the different farms, as regards the character or amounts of the single feeding stuffs used. The report contains detailed information as to the feed consumed and the production of the various lots in each experimental period; also chemical analyses of the feeding stuffs and the milk. Some of the average data for the 2 years are given in the following table:

Average results of feeding grain versus roots.

	Rations fed.					Daily yield of milk.	Composition of milk.				
	Grain.	Oil cakes.	Dry matter in roots.	Hay and straw.	Nutritive ratio.		Solids.	Fat.	Protein.	Milk sugar.	Ash.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*		*Lbs.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Lot A	7	1	5	16	1:8.0	22.4	11.73	3.11	3.02	4.82	0.78
Lot B	4	4	5	16	1:5.0	23.7	11.86	3.16	3.13	4.80	.77
Lot C	4	1	8	16	1:9.0	22.5	11.74	3.11	3.02	4.84	.77
Lot D	1	4	8	16	1:5.5	24.2	11.84	3.09	3.12	4.86	.77

The effect of the different feeds on the chemical composition of the milk was not marked, but small improvement in the contents of solids and fat was plainly brought out by the feeding of oil cakes or grain in the place of roots. A slightly higher production of milk was obtained in the case of the lots fed roots than with the grain-fed lots, and 1 lb. of dry matter in mangolds was, therefore, somewhat more valuable than 1 lb. of grain; the dry matter of kohl-rabi, which was fed in 2 trials, was found to possess a somewhat lower feeding value than that of the mangolds fed.

For practical purposes, however, it may be assumed that the dry matter in roots has a similar feeding value as its weight of grain. This is the same result as was obtained by Fjord with swine in earlier experiments at the station (E. S. R., 5, p. 428; 7, p. 243). The author shows that this relation will hold good only under ordinary practical farm conditions, when the rations contain a sufficient amount of the different nutritive substances required for milk production and when the relation between these is such that the rations fed are not one sided.

A consideration of the economy of production and feeding of roots and grain discloses the fact that nearly three times as much root-dry matter as grain is grown on an acre of land in average seasons, and when the expense of growing the crops is considered, a gain of about $7.37 per acre is obtained if the root acreage is increased from about 5 to 15 per cent of the area used for the supply of winter feed to cows; and if the acreage is increased from about 15 to 25 per cent, a further gain of about $4.79 per acre of this area is obtained.

The economic limit for the extent of growing roots in Denmark under present average conditions of yields and prices lies at one-third of the area utilized for supplying winter feed to cattle. The results of the investigation clearly indicate that it is advantageous to arrange the cultivation of the area which is to furnish cows with winter feed in such a way that, besides the requisite amount of hay, large quantities of roots may be grown, so that a considerable amount of root-dry matter will be available for feeding dairy cows, even if the nutritive ratios thus reached are wider than those generally considered advantageous in feeding cows.

The results obtained in the case of the different lots showed in a decided manner the superior value of oil cakes over grain and indicate that $\frac{4}{5}$ of a pound of the more nitrogenous oil cakes, cotton-seed cake, peanut cake, and sesame cake, and $\frac{5}{6}$ of a pound of the less nitrogenous oil cakes, like sunflower-seed cake, rape-seed cake, etc.,

have a similar feeding value as a pound of grain (=1 "food unit"). These relative figures are recommended for use in the calculation of the feed consumption of dairy cows by test associations. Other comparative values used in the calculations of these results are: 1 lb. small grains or maize = 1 lb. molasses feed = $2\frac{1}{2}$ lbs. hay = 5 lbs. straw.—F. W. WOLL.

On the relation of food to the production of milk and butter fat by dairy cows, F. W. WOLL (*Wisconsin Sta. Bul. 116, pp. 85*).—This is a detailed critical review of experimental work on this subject, a list of references being given in an appendix. The author's summary of the discussion follows:

"Economic production of milk and butter fat by dairy cows as regards food consumption is dependent on a number of factors, chief among which is the capacity of the cow for converting considerable amounts of food materials into milk without at the same time gaining in body weight. Other factors are, the stage of the lactation period, the age of the cow, the amount of feed eaten, and the character of the rations fed as to succulence and nutritive ratio.

"The amount of nutrients consumed over and above maintenance requirements per 100 lbs. of milk ranges in the case of different cows, at least between 26.8 and 80.2 lbs. of dry matter, and per 1 lb. of butter fat between 6.8 and 18.6 lbs. of dry matter. The amount of net digestible protein consumed has in the same way been found to range from 3.16 to 9.07 lbs. per hundred lbs of milk produced, and from 0.76 to 1.70 lbs per pound of butter fat.

"Good dairy cows have the power of producing a unit of milk or butter fat from a smaller amount of dry matter than cows of less pronounced dairy capacity. The production of a unit of rich milk calls for a larger supply of valuable food components than is required in the case of poor milk. For every per cent of increase in the fat content of the milk, the amount of net dry matter required for the production of 100 lbs. increases about 8 lbs., and the amount of net digestible protein increases about 0.8 lb. The amount of nutrients consumed per unit of butter fat produced decreases slightly with an increasing fat content of the milk, viz, about 0.6 lb. of net dry matter and 0.08 lb. protein for each per cent of fat in milk.

"The amount of food materials required for the production of a unit of milk or butter fat is nearly three times as large toward the close of the lactation period as at its beginning.

"Heifers require a larger proportion of nutrients for the production of a unit of milk or butter fat than do older cows. Optimum results as regards the efficiency of the food consumed are obtained when the cows have reached about 7 years of age; the period of usefulness of cows depends on their constitutional strength and the system of feeding and handling to which they have been subjected.

"Recent evidence goes to show that the food of the dairy cow influences the quality of the milk produced to this extent, that the cow will yield a maximum flow of milk of the highest fat content which she is capable of producing on rations relatively rich in nitrogenous substances. The productive capacity of the cow, the prices of feeding stuffs and of the milk products are the main factors that will determine how highly nitrogenous rations can be fed to advantage. Under ordinary conditions in the north central States it will not, as a rule, be advantageous to feed rations containing over 2 lbs. of digestible protein a day, and of a nutritive ratio narrower than 1 : 6.7, to cows of average dairy capacity."

The relation of food to dairy production, F. W. WOLL (*Wisconsin Sta. Bul. 117, pp. 16*).—This is a popular edition of Bulletin 116 of the station noted above.

Discussion of the amount of protein required in the ration for dairy cows, C. L. BEACH (*Connecticut Storrs Sta. Bul. 34, pp. 22*).—The data upon which this discussion is based have been published from time to time in the annual reports of the station (E. S. R., 6, p. 458; 7, p. 603; 8, p. 430; 9, p. 786; 10, p. 681; 13, p. 983; 14, p. 1005). The general plan has been to ascertain the rations actually fed different dairy

herds in the State, and then to substitute gradually for these rations others considered by the station as better adapted to milk and butter production.

Twenty-one herds, comprising 277 cows, were fed rations recommended by the station 4 weeks after feeding the original rations, the comparative results showing an average daily increase of 0.25 lb. in yield of milk which, added to 0.85 lb., the estimated shrinkage on a uniform ration due to advance in lactation, makes a total gain of 1.10 lbs. The recommended rations contained 0.66 lb. grain and 0.51 lb. protein more than the original rations, but 1,070 calories, 1.47 lbs. of dry roughage, and 3.1 lbs. of silage and roots less than the original rations. Taking into consideration the increased yield of milk, a saving in the cost of food, and an increase in the value of the manure, a total daily gain per cow of 2.02 cts. resulted from the change of rations.

It is not believed by the author that this saving was due solely to the increase in protein fed, but that part of it was due to an increase in the amount of grain fed. The addition of protein was most effective when the original ration contained less than 1.5 lbs. of protein. The cost of food in the recommended rations was less than that in the original rations owing to the smaller quantities of nutrients fed. Decreasing the fuel value of a ration when it was above the standard either did not affect or increased the value of the ration. The food cost of milk was not materially affected by the substitution of rations.

The results on the whole justify recommendations previously made by the station that more protein than is ordinarily contained in dairy rations may be fed with economy, but that in so doing greater emphasis should be placed upon the increased value of the manure.

On the protein question, with special reference to the protein minimum of milch cows, M. Hindhede (*Ber. K. Vet. Landbohöjskoles Lab. Landökon. Forsög. [Copenhagen], 55 (1904), pp. 74–104*).—The author discusses the results of the feeding experiments with milch cows at Copenhagen Experiment Station, which have a bearing on the question of the physiological and economic minima of protein in the rations of dairy cows.

Reference is made to the dietary studies by Atwater and Rubner in regard to the protein requirements of man, and it is shown that the need of protein in the nutrition of man is much smaller than has heretofore been assumed, and the same apparently holds true in the case of rations for dairy cows as well. The author concludes that protein has no special value for increasing the milk secretion, unless the amount supplied is exceedingly low. While Wolff recommends feeding digestible protein estimated as equivalent to 0.90 lb. per 10 lbs. of milk, the author finds that only one lot out of the 28 in the experiments received as much.

The lots fed large amounts of protein in their rations received, on the average, 0.44 lb., and those fed small amounts received 0.26 lb. of net digestible protein per 10 lbs. of milk. The experiments indicate that the fat of the milk is not formed from the protein of the food, since the protein supplied in the rations may be reduced until there can be no excess available for fat formation, without causing any decrease in the total fat of the milk. Above the physiological minimum protein is valuable, therefore, only for its potential fuel value, and it is, therefore, not advantageous to go far beyond the minimum, although the loss thus incurred is, to a large extent, offset by the increased value of the manure.

Under certain conditions there may be an economical minimum, below the physiological minimum, and, according to the evidence at hand, no deleterious effect on the future production of the cows will be apparent if less than the physiological minimum is supplied for a considerable period of time.—F. W. WOLL.

Records of dairy herds, A. J. Glover (*Illinois Sta. Circ. 84, pp. 38, figs. 21*).—Records of 10 dairy herds for 2 years are summarized and illustrations are given of many of the cows. The work is a continuation of that published in Bulletin 85 and Circular 77 of the station (E. S. R., 15, p. 292; 16, p. 402).

The 10 herds included 145 cows, the average production of which was 4,944 lbs. of milk and 201 lbs. of butter fat the first year, and 5,611 lbs. of milk and 229 lbs. of butter fat the second year. This increase in yield of over 13 per cent was attributed to the better care of the cows, the feeding of better rations, the elimination of several poor cows, and the purchasing of several good animals. The best individual record was 7,190 lbs. of milk and 367 lbs. of butter fat, and the poorest 4,560 lbs. of milk and 135 lbs. of butter fat.

Dairy farm, J. B. KNIGHT (*Ann. Rpt. Expt. Farms, Bombay Pres., 1904, pp. 53–56*).—Records are given of a dairy herd for 5 years, 1899–1904. In 1904 the herd consisted of 151 cows and 85 buffaloes. The average yearly yield of the cows for 5 years was 2,067 lbs. of milk and of the buffaloes 2,805 lbs. Buffaloes fed yams maintained their yield of milk better than buffaloes fed green fodder. Very little difference was observed in the results obtained in feeding different kinds of green fodder.

Dairying (*Queensland Agr. Jour., 15 (1905), No. 6, pp. 768, 769*).—In addition to the usual monthly records of the dairy herds, analyses of colostrum milk and skim milk are reported. The average fat content of the skim milk of the different breeds compared was as follows: Ayrshire, 0.264; Holstein, 0.188; Jersey, 0.169, and Shorthorn 0.182 per cent.

Does it pay to produce rich milk? N. A. HANSEN (*Abs. in Ugeskr. Landm., 50 (1904), No. 50, p. 562*).—The results obtained with 172 dairy herds, aggregating 3,723 cows, were studied. The cows were arranged in 8 classes according to the average per cent of fat in their milk, each class having about the same number of cows.

In the case of Class I (richest milk), 70.8 food units were required for the production of 100 pounds of milk, against 65.0 units in the case of Class VIII (poorest milk). One pound of butter required 16.83 food units in Class I, and 19.52 units in Class VIII. The skim milk obtained per pound of butter was 22.3 and 28.4 lbs., respectively, for the two classes. At ordinary prices of feeds and products it was found that a pound of butter was produced 2.8 cts. cheaper by the cows producing rich milk than by those yielding milk low in butter fat.—F. W. WOLL.

Observations on the variations in the quantity and composition of the mixed milk of a herd of cows on pasture, with special reference to changes in pasture and weather, A. KIRSTEN (*Landw. Jahrb., 33 (1904), No. 6, pp. 925–937*).—The herd under observation comprised 20 cows. Changing from poor to good pasture caused regularly a sudden increase in the yield of milk, but in itself was apparently without influence upon the composition of the milk. An exceptionally great decrease in the yield of milk during a period of 2 months was attributed to the influence of continuous bad weather, which, to a large extent, caused also great variations in the percentages of fat and total solids.

The daily variations in the different constituents of cows' milk during the course of lactation, J. H. HINCHCLIFF (*Mitt. Landw. Inst. Univ. Leipzig, 1904, No. 5, pp. 1–112, pls. 8*).—This is a detailed report upon studies made with 3 cows.

It was found that the greatest variations were in the fat content of the milk followed by milk sugar, protein, and ash in the order mentioned. An increase or decrease in the fat content of the milk was generally accompanied by a similar change in the fat content of the milk solids, but by an opposite change in the percentage of protein and milk sugar in the solids. The ash content of the solids-not-fat was practically constant. Variations in the content of milk sugar in the solids-not-fat ran inversely to the variations in the protein content.

The composition of the milk of individual cows showed at times great variations not only in regard to fat but also protein, ash, and milk sugar. The daily variations in the composition of the milk were often traceable to the influence of food, sexual excitement, or disease, which subjects are discussed at some length. Even with equal intervals between milkings there was considerable variation in the milk from

morning to evening, for much of which no cause could be assigned. In general, the percentages of fat, protein, and ash increased with the progress of lactation, while the percentage of sugar decreased.

As compared with the morning milk the evening milk had a higher content of fat, protein, and ash, but a lower content of milk sugar. A similar difference was observed in the milk obtained at the beginning and at the end of the lactation period. A relatively high fat content was accompanied by a low percentage of sugar, and vice versa. Fleischmann's formula for total solids gave results from 0.08 to 0.14 higher than Richmond's formula. The use of these formulas failed to give accurate results in all instances with individual cows or single milkings. If, on the contrary, several milkings were averaged, and especially if the cows were in the early stages of lactation, the results were much more accurate. With cows in the last stage of lactation the calculated results were too low.

Study of the variations in the composition of milk, TOUCHARD and BONNÉTAT (*Bul. Mens. Off. Renseignements Agr., 3 (1904), No. 12, pp. 1443–1453*).—Daily analyses of the milk of a number of cows are reported and attention is called to the variations in the content of fat and other constituents.

Modifications of the rations fed, variations in the relative humidity of the atmosphere, and abrupt changes in the management of the cows were studied as causes of the daily variations which, in some instances, were as great as $\frac{1}{3}$ of the percentage of fat. Other causes of variations are mentioned and the adulteration of milk by skimming or by adding water is discussed.

Composition of the milk of the breeds of cows in the agricultural institute of the University of Leipzig, W. VOLBORTH (*Mitt. Landw. Inst. Univ. Leipzig, 1904, No. 5, pp. 113–192*).—Data obtained at the institute during a series of years are presented and discussed as regards the influence of breed, individuality, and stage of lactation on the fat content of milk. Records of 46 cows, representing 17 breeds, are reported.

Influence of the Hegelund method of milking upon milk secretion, A. WENCK (*Mitt. Landw. Inst. Univ. Leipzig, 1904, No. 6, pp. 61–132*).—The author discusses the secretion of milk, describes the various methods of milking, reviews the results obtained by the Hegelund method in different countries, and reports in detail a series of experiments conducted with 8 cows.

The additional milk and fat obtained by the Hegelund method following the usual method of milking was not considered as an actual increase in yield but rather as an advanced portion of the following milking. Calculations of profit based upon such data are therefore considered erroneous. The secretion of milk or milk fat during the process of milking was not believed to be greater than in the interval between milkings.

The composition of the after milk obtained by the Hegelund method was not essentially different from the last portion of the milk obtained by the ordinary method. The fat content of the after milk and also the total solids were very high. The solids-not-fat were present in smaller quantities than in milk obtained by the usual method. Aside from the fat the relation of the constituents in the two portions of milk was practically the same. The greater the quantity of milk in the udder the more fat it is believed remains behind in the milk ducts, which is offered in explanation of the fact that after long periods between milkings the fat content of the milk is less than after short periods.

It is believed that the milking should be thorough, not, however, for the purpose of increasing the yield of fat, but for the purpose of developing the productive capacity of the udder.

The success of the Hegelund method is thought to depend upon the after effects of the stimulation which is exerted upon the udder by thorough milking. It is believed that the Hegelund method tends to lessen the decrease in yield of milk due

to advancing lactation rather than to increase milk production. This influence is independent of the breed, age, and productiveness of cows and difficulty in milking, but is dependent upon the stage of lactation and the individual.

The author does not recommend the general introduction of the Hegelund method, believing that only by very conscientious attendants and the utmost care can success be obtained, and that then the additional yield is not sufficient to pay the increased cost. Furthermore, the contamination of milk by the Hegelund method is likely to be much greater than by the ordinary method.

The composition of milk and cream and their by-products, R. A. Pearson (*Cornell Reading Course for Farmers, 5. ser., No. 22, pp. 401–416, figs. 5*).—In addition to general information on this subject this includes a method of standardizing milk and cream.

On the precipitin reaction of human and cows' lacto- and caseosera, S. Amberg (*Jour. Med. Research, 12 (1904), No. 3, pp. 341–358*).—The precipitin reaction of lactoserum and caseoserum obtained from rabbits by injecting milk and casein solutions, respectively, was not found to depend upon the casein being in the form of a calcium salt, nor upon the presence of a soluble inorganic calcium salt.

Calcium chlorid accelerated the reaction in a manner not understood. No difference was observed in the behavior of lactoserum and caseoserum toward their corresponding milk, casein, or lactalbumin. There was no interreaction of cows' lactoserum and caseoserum with human milk, casein, or lactalbumin, or vice versa.

The susceptibility of putrefying and lactic-acid bacteria to poisons, O. Rahn (*Centbl. Bakt. u. Par., 2. Abt., 14 (1905), No. 1, pp. 21–25*).—The resistance of lactic-acid bacteria and various species of putrefying micro-organisms including *Bacillus proteus, B. subtilis, B. mesentericus, B. fluorescens* to mercury chlorid, copper sulphate, formaldehyde, phenol, sodium benzoate, menthol, and other antiseptics was studied. The culture media used were milk heated to 60 and 100° C., acid and neutral whey, and bouillon with and without the addition of milk sugar.

Contrary to results reported by Bokorny the author found that, on the whole, molds and putrefying bacteria were more resistant to antiseptics than lactic-acid bacteria. Sodium benzoate and menthol in milk formed exceptions to this statement. In repeated tests mercuric chlorid, formaldehyde, boric acid, and salicylic acid showed greater antiseptic properties in heated than in unheated milk, while the reverse was true of copper sulphate, sodium benzoate, phenol, and menthol. The reason for this was not apparent. Milk treated with copper sulphate regularly became slimy instead of curdling, which was found due to a large actively motile bacillus.

It is considered worthy of note from a hygienic standpoint that molds and yeasts were especially resistant to formaldehyde, since this substance has been recommended as a preservative of milk for infants.

Do the soluble proteids of milk possess specific bactericidal properties? P. Sommerfeld (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 5, pp. 716–721*).—Lactalbumin and lactoglobulin obtained by filtration were found to possess no specific bactericidal action against typhoid and coli bacilli.

Experiments with Fliegel's cotton filter, H. Tiemann (*Milch Ztg., 33 (1904), No. 51, pp. 805–807*).—The author reports very favorably upon this cotton filter as regards the removal of dirt from milk. A bacteriological study is to be made later.

Milk control with the cooperation of veterinarians, Schuemacher (*Deut. Tierärztl. Wchnschr., 13 (1905), Nos. 4, pp. 37–40; 5, pp. 49–51*).—The importance of a well-regulated milk supply is critically discussed. Attention is called to the regulations which prevail in various cities for guaranteeing a good quality of ordinary market milk and milk for hospitals and the feeding of children. The subject is discussed from the standpoint of the benefits to be derived from the veterinary control of the condition of the dairy cows and of the milk furnished for use.

Milk as a carrier of disease, H. M. BIGGS (*Proc. New York Farmers, 1903-4, pp. 17-21*).—This is a general discussion of this subject, with particular reference to the sanitary conditions of dairies in New York, and with brief mention also of outbreaks of disease traceable to the milk supply which have been studied by the author.

Report of the Iowa educational butter contest, G. L. MCKAY and C. LARSEN (*Iowa Sta. Bul. 80, pp. 305-323*).—Fifty-five butter makers in different localities in the State cooperated during 1903 in sending tubs of butter to the station where they were scored and then reshipped to New York, at which place they were again scored. According to the plan each exhibitor was to send a 30-pound tub every other month, but for various reasons only 223 instead of 330 tubs were received from the 55 exhibitors during the year.

The objects of the test were to stimulate more interest in good butter making, to locate creameries where the poorest butter was made, to study seasonal variations in the composition and quality of creamery butter, causes for the wide variations in the overrun obtained in different creameries, and the effect of the composition of butter upon the quality and keeping properties. Tabulated data show the scores and chemical analyses of the different samples and also remarks of the judges.

The data relating to seasonal variations are summarized in the following table:

Average scores and analyses of Iowa creamery butter.

Month.	Number of samples.	Score at station.	Score at New York.	Average score.	Composition.			
					Fat.	Moisture.	Curd.	Salt.
					Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
January	43	90.98	88.3	89.73	84.94	11.70	1.50	1.86
March	49	90.83	87.31	89.06	85.18	12.08	1.10	1.64
May	43	92.65	90.55	91.60	83.90	12.67	1.04	2.39
August	38	92.51	86.79	90.66	83.29	13.53	.98	2.20
November	25	92.05	89.18	90.62	83.15	13.55	1.34	1.96
January	26	93.62	88.66	91.15	83.03	13.70	1.44	1.83

The amount of overrun in different creameries was shown to be greatly influenced by the composition of the butter, which in 221 samples was found to vary in salt content from 0.1 to 6.7 per cent, in water content from 7.56 to 20.67 per cent, and in curd from 0.64 to 3.27 per cent. Eight samples contained more than 16 per cent of water.

As regards the quality of the butter it was concluded that the quality of the cream and the methods employed in the manufacture of the butter are of more influence than the composition of the butter. The keeping quality of the butter was not regularly affected by the amount of curd present. It is believed, however, safer to have less than 1 per cent of curd than 2 per cent or more present.

Salt in butter, G. L. MCKAY and C. LARSEN (*Iowa Sta. Bul. 80, pp. 324-334*).—In experiments by F. W. Bouska to determine the effect of salt upon the growth of micro-organisms isolated from butter, a yeast showed a luxuriant growth in a medium containing 2 per cent of salt and a slight growth in a medium containing 6 per cent of salt; *Penicillium glaucum* showed a slight growth in a medium containing 10 per cent of salt and a rank growth in a medium containing less than 9 per cent; a spore-bearing bacillus showed only a trace of growth in a 4 per cent salt medium, and no growth in one containing 6 per cent, and a gas-producing organism showed only a weak growth in a medium containing 4 per cent of salt. Salt is believed to act as a preservative in butter to a greater degree than is ordinarily considered.

Salt was found to be insoluble in pure butter fat.

While water at 58° F. is capable of dissolving 35.94 per cent of salt, the water existing in a mechanical mixture with the fat and other constituents of butter was found to be capable of dissolving only 16.78 per cent, with 16.57 per cent as an aver-

age of 3 experiments in which the butter was worked 18 revolutions at intervals during 2 hours. When the time was shortened to 1 hour the maximum per cent of salt dissolved was 14.84 per cent.

"According to these experiments the maximum amount of pure salt (NaCl) which can be dissolved in butter during two hours when worked 18 revolutions at intervals in a Victor churn, and containing a maximum percentage of water (16 per cent), is about 2.68 per cent."

Factors influencing the amount of salt in finished butter are stated to be the amount and condition of moisture in the butter at the time the salt is added, the amount and condition of the salt used per pound of fat, the amount and time of working, the size of the butter granules, the hardness and softness of the butter, and the amount of butter in the churn.

When the water in butter was saturated with salt or saturated to a certain degree which was ascertained in several experiments, it was found that undissolved salt, if evenly distributed, can be present without causing mottles. Methods for estimating the percentage of salt in the water of butter are given.

On the average molecular weight of nonvolatile fatty acids in Holland butter, A. Olig and J. Tillmans (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, pp. 728–730*).—Determinations were made of the Reichert-Meissl number and the molecular weight of the nonvolatile fatty acids of a number of samples of Holland butter. The molecular weight varied from 255.4 to 271.6. Three samples of butter from another source showed molecular weights of about 267. The butter can not, therefore, be considered adulterated, according to the authors, on the ground of a molecular weight of over 261, as has been suggested. This is published as a preliminary note on investigations along this line.

Preliminary report on experiments with Disbrow and Holstein churns (*Mälkeritid., 17 (1904), No. 47, pp. 847, 848*).—The experiments were conducted by the Copenhagen Experiment Station at two different creameries, 25 comparative trials having been made in all.

Nos. 6 and 7 of the Disbrow combined churn and worker were used, with a capacity of 5,200 and 6,200 lbs., but they were only half filled in order to secure the best churning conditions and a good quality of butter. The capacity of the Holstein churns used was 400 to 500 lbs. No appreciable differences in the flavor or the grain were obtained in the scorings of the butter made in the 2 ways, and the water content of the butter, as well as the fat content of the buttermilk, were similar in both series. The Disbrow churns required less power than the Holstein churns with butter worker.—F. W. WOLL.

On the action of different lactic-acid bacteria on the ripening of cheese, E. von Freudenreich and J. Thöni (*Landw. Jahrb. Schweiz, 18 (1904), No. 11, pp. 531–555, pl. 1; Ann. Agr. Suisse, 6 (1905), No. 1, pp. 27, pl. 1; Rev. Gén. Lait, 4 (1905), Nos. 8, pp. 169–181; 9, pp. 200–209; 10, pp. 225–232; 11, pp. 247–258; Centbl. Bakt. u. Par., 2. Abt., 14 (1905), No. 2, pp. 34–43, pl. 1*).—*Bacterium lactis acidi* and several forms isolated from Emmenthal cheese and designated in the present work, *Bacillus casei* α, *B. casei* γ, *B. casei* δ, and *B. casei* ε, were studied as regards their behavior in various culture media, resistance to heat and drying, production of acid, and fermentative action on different kinds of sugar.

In experiments with small, medium, and large sized cheeses the influence of these micro-organisms and also *Micrococcus casei liquefaciens* was studied in connection with tests of natural and artificial rennet. The use of pure cultures with artificial rennet is believed to be capable of giving as good results in practice as natural rennet and to have certain great advantages over the latter. In the first place the preparation of a good natural rennet is always difficult. In experimental work to be reported later it was ascertained by one of the authors that the stomachs of calves often contained gas-producing organisms in large quantities and, in certain instances, the

cause of gassy cheese has been traced to this source. This danger is, of course, avoided with the use of artificial rennet.

The only objection which has been raised to the use of artificial rennet, viz, less satisfactory ripening of the cheese, may be overcome, according to the author, by the use of pure cultures with the artificial rennet, which method has the second advantage of permitting the use of such cultures as may be found in experience to give the best results. While the present investigations contribute to this question, further work is considered necessary to determine the best lactic ferment for this purpose.

On the ripening of cheese, LINDET, L. AMMANN, and HOUDET (*Rev. Gén. Lait, 4 (1904), Nos. 1, pp. 1-8; 2, pp. 25-31*).—From the results of a chemical study of the changes taking place in Camembert, Port Salut, and Gruyère cheese during the process of ripening the authors conclude that the relative production of soluble casein, ammonia, and volatile acids in these different kinds of cheese is related to the acidity or alkalinity and the moisture content of the medium. The quantity of ammonia is not proportional to that of soluble casein.

The decomposition of the casein in the exterior and interior of Camembert cheese corresponds to the percentage of casein present in the different layers, which, in the samples studied, was higher in the interior of the cheese. In this cheese no lactic acid is present at the beginning of ripening, molds do not thrive, and the proportion of volatile acids is constant during maturation.

In Gruyère cheese ripening is accompanied by increasing quantities of acetic, propionic, and lactic acids. The production of volatile acids keeps pace with the formation of ammonia. The fat takes no part in the process of ripening and is not saponified in the presence of the ammonia produced. The volatile acids come solely from the decomposition of the casein.

On the cause of a red coloration in cheese, O. GRATZ (*Milchw. Zentbl., 1 (1905), No. 1, pp. 9-12*).—Brief notes are given on the various micro-organisms which have been reported as causing a red coloration in cheese, and the cultural characteristics of a new species isolated from the exterior of a colored cheese are reported.

The name of *Micrococcus rubri casei* is given to this organism. It is believed that the micrococcus gained access to the milk before it was made into cheese. The development of the red color was not affected by the application of a 3 per cent solution of boric acid or a 1 per cent solution of formalin to the surface of the cheese. The quality of the cheese was materially affected by the micrococcus.

Inquiry concerning the dairy industry (*Enquête sur l'industrie laitière. Paris: Min. Agr., 1903, vol. 1, pp. LXXX + 532, map 1*).—This is the first volume of a report on the dairy industry in France and other countries. In the general introduction are set forth the methods employed in collecting the information, the dairy situation before the nineteenth century, the results of a similar inquiry in 1813, and the general results of the present inquiry.

In 1902 the total number of cows in France was 8,317,924, and the total production of milk 77,241,944 hectoliters, valued at 1,063,802,460 francs. In addition, the milk produced by sheep was valued at 3,500,000 and by goats 24,000,000 francs. Part I of the volume presents detailed, statistical, and other information on the present status of the dairy industry in the different departments of France, and Part II similar information on the dairy industry in 20 other countries.

A review of the development of the dairy industry in Germany during the last ten years, SIEGLIN (*Fühling's Landw. Ztg., 53 (1904), Nos. 18, pp. 684-689; 19, pp. 715-720; 20, pp. 756-766*).

Thirty-second Annual Report of the Wisconsin Dairymen's Association (*Madison, Wis.: Democrat Printing Co., 1904, pp. 194*).—Among the numerous articles included in this report particular mention may be made of the following: The Importance of Feeding Milling By-Products in Wisconsin, by W. A. Henry, in which special emphasis is laid on the fertilizing constituents of the feeding stuffs; Whey

Butter, by H. E. Alvord, in which standards for butter are discussed; and Bacteria in Milk Supplies for City and Factory Use, by H. L. Russell, dealing with the sanitary production of milk.

Legislation relative to the milk trade (*Rev. Soc. Sci. Hyg. Aliment., 1* (*1904*), *No. 3, pp. 219–252*).—A summary of regulations regarding the sale of milk in Germany, Belgium, France, Italy, Switzerland, England, Denmark, and the United States.

VETERINARY SCIENCE AND PRACTICE.

Atlas and epitome of general pathologic histology, H. Dürck (*Philadelphia: W. B. Saunders & Co., 1904, pp. 371, pls. 80, figs. 36*).—This is a translation from the German edition and is edited by L. Hektoen. The purpose of the volume is to present a general discussion of pathologic histology, with full details concerning the nature and histology of different morbid growths. The material discussed in the volume is classified under the subjects of circulatory disturbances, atrophy, retrogressive metamorphoses, reparative processes, and tumors.

The problem of agglutination and particularly the rôle of bacterial flagella, G. de Rossi (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36* (*1904*), *No. 5, pp. 685–691; 37* (*1904*), *No. 1, pp. 107–115, figs. 3*).—The experiments reported in this paper were chiefly concerned in determining the modification of the flagella due to agglutination and the phenomena of agglutination following upon the inoculation of experimental animals with bacterial bodies or with bacterial flagella of the same species.

The organism used in this experiment was *Bacillus subtilis*. Apparently there is no visible modification of structure, arrangement, or number of the flagella which can be attributed to the phenomenon of agglutination. The flagella play the most important rôle in fixing the agglutinin. The bacterial bodies are of less importance in this respect. The more conspicuous manner in which the phenomenon of agglutination takes place in the case of motile bacteria finds its explanation in the great sensitiveness of flagella toward the agglutinating substances of specific sera.

Specific fixation of agglutinins in absorption experiments, F. Ballner and R. von Sagasser (*Arch. Hyg., 51* (*1904*), *No. 3, pp. 266–280*).—Numerous experiments were carried on by the authors, chiefly for the purpose of determining certain points in the agglutination of coli bacillus, typhoid bacillus, and other pathogenic bacteria.

The authors were unable to find a satisfactory explanation of the nature of the fixation which takes place with regard to agglutinins under certain conditions. Whether this process is of a physical or chemical nature is still undetermined, but the weight of evidence is believed by the authors to be in favor of considering it a chemical process.

The relation between precipitins and agglutinins of bacteria, R. Kraus and J. Joachim (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36* (*1904*), *No. 5, pp. 662–671; 37* (*1904*), *No. 1, pp. 73–79*).—A general discussion is presented of the problem of immunization by means of bacteria and bacterial filtrates, whether treated or not with heat.

As a result of their investigations the authors conclude that there are 2 substances which produce agglutinins and 2 distinct agglutinins. The latter may be produced by bacteria and also by bacterial filtrates. The formation of the agglutinin may take place in connection with an agglutinogenous substance deprived of its coagulable group of bodies. The authors' experiments apparently support the theory of the identity of agglutinins and precipitins.

The influence of temperature upon specific and nonspecific agglutination, E. Weil (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36* (*1904*), *No. 5, pp. 677–684; 37* (*1904*), *No. 1, pp. 98–107*).—The experiments reported in this paper were largely confined to a study of the typhoid bacillus.

It was found that the more rapid agglutination of the typhoid bacilli at a temperature of 55° C. depends apparently upon the cooperation of the agglutinable substance and the agglutinin, and is therefore to be considered as a reaction which occurs more rapidly at high temperatures. Notes are also given on the effect of gelatin in agglutinating typhoid bacilli. It was found that the gelatin exercises some effect upon the bacilli whether or not they had been previously heated.

The properties of complement and the chemical theories of immunity, J. Bordet (*Ann. Inst. Pasteur, 18 (1904), No. 10, pp. 593–632*).—The author presents a general review of this subject, in which the different theories relating to immunity are discussed.

A series of experimental studies was carried out for the purpose of obtaining further information regarding the nature of complements and other bodies in the sera of normal and immunized animals. It was found that the red blood corpuscles, after treatment with appropriate hemolytic sera from another species of animals, lose their susceptibility to alexin if they are brought in contact with the antagonistic serum.

When obtaining an antiserum capable of neutralizing the specific complements in the serum of a given species, it is not strictly necessary to inject these specific complements into the animal, but the injection of the normal serum of another species suffices. It is concluded that the theory of Ehrlich is erroneous in so far as it requires that the specific alexins are identical with the cell receptors against which the organism is immunized.

The formation of homologous and heterologous agglutinins in the animal body, F. Ballner and R. von Sagasser (*Arch. Hyg., 51 (1904), No. 3, pp. 245–265*).—For the purpose of obtaining immune sera, rabbits and dogs were used and these animals were inoculated with various micro-organisms, including typhoid bacillus, coli bacillus, anthrax bacillus, and organisms of tetanus, cholera, fowl cholera, swine erysipelas, etc., as well as proteid substances.

Detailed notes are given on the results of these experiments and the results are compared with those obtained by other authors. It was found that in general the agglutinating action of a blood serum is considerably more pronounced toward the corresponding organism than toward an unrelated species. The more striking the agglutinating power toward a certain micro-organism the more certain is the diagnosis of the disease. The results obtained by serum diagnosis can not always be depended upon, since occasionally they give false indications. As a rule, however, this method is considered trustworthy.

Immunization and its practical application, L. Van Es (*Amer. Vet. Rev., 27 (1904), No. 12, pp. 1140–1153*).—A brief discussion of the methods and value of immunization in a number of diseases, including anthrax, black leg, contagious pleuro-pneumonia, tuberculosis, etc.

Note on a method of maintaining the virulence of a pathogenic micro-organism, W. St. C. Symmers (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 1, pp. 23, 24*).—The author's experiments were made on the bacillus of Asiatic cholera, but are believed to be applicable to other pathogenic organisms. The method consists essentially in greatly increasing the virulence of the organism by repeated passage through guinea pigs, after which the virulence may be maintained with a gradual diminution in agar cultures without necessitating the constant reinoculation of experimental animals.

Some common diseases of stock, C. F. Dawson (*Florida Farmers' Inst. Bul. 2, pp. 77–97*).—Notes are given on the symptoms, pathological anatomy, distribution, and treatment of salt sickness, contagious sore eye, milk fever, garget, scours, colic in horses, and diseases of pigs and dogs.

Report of the chief inspector of stock, J. R. Weir (*Jour. Dept. Agr. Victoria, 2 (1904), No. 9, pp. 860–872*).—Brief notes on the diseases of cattle, sheep, and hogs observed in various parts of Victoria, together with special reports on the sanitary conditions which prevail in different districts of the colony.

Some stock diseases of the eastern coastal districts, T. BOWHILL (*Agr. Jour. Cape Good Hope, 25 (1904), No. 3, pp. 331–337*).—Brief notes are given on a number of diseases which may be considered as due to various Hæmocytozoa and Pasteurella. These diseases include red water, malignant malaria of dogs, biliary fever of horses, coast gall sickness, white scours, etc.

Cattle and horse diseases in South Africa, F. H. MASON (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 285, pp. 1066, 1067*).—Attention is called to the importance of the results obtained by the investigations of Professor Koch in South Africa with regard to the nature and means of preventing Rhodesian tick fever and South African horse disease.

The veterinary section, A. THEILER ET AL. (*Transvaal Agr. Jour., 2 (1904), No. 8, pp. 555–577, pls. 10*).—A further contribution is made to the diagnosis of heartwater in cattle.

It appears from a study of this disease that heartwater may be produced in cattle by injecting virulent blood obtained from affected sheep. The disease appears in a great many different forms which are frequently referred to different causes. The period of incubation varies from 6 to 15 days, but averages about 12 days. Serious symptoms may be almost entirely absent in cases where the animals die suddenly.

Notes are given on measles in swine and cattle. The appearance of bladder worms in meat is described and notes are given on the methods of infection in man and animals and on the best preventive measures for eradicating these pests. Brief accounts are also given of the utility of zebra hybrids, regulations regarding the driving of live stock and quarantine rules, stock thefts, and the deliberations held at the intercolonial veterinary conference.

The enzootic occurrence of carcinoma in animals, L. LOEB (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 2, pp. 235–245, figs. 5*).—Brief notes are given on the occurrence of cancer in enzootic form in cattle, rats, and other animals. The pathological anatomy of cancer in these animals is discussed, together with notes on the etiology of the disease.

Human and bovine tuberculosis, N. RAW (*British Med. Jour., 1904, No. 2284, pp. 907–909*).—Attention is again called to the absolute contradiction between the opinions of Koch and von Behring on this subject. The author agrees in general with Koch on the point that bovine and human tuberculosis are distinct diseases. He argues, however, that man is subject to both forms of tuberculosis, one being conveyed by infection from one person to another, and the other by receiving bovine tubercle bacilli in milk or meat of tuberculous animals. The author made a study of 3,000 cases of pulmonary tuberculosis in man, in which the lesions were found to be confined strictly to the lungs in all except 14 cases. In post-mortem examinations the lungs were frequently found to be affected by 2 distinct kinds of tuberculosis, one of a slow nature and the other more acute. It is believed, therefore, that primary intestinal tuberculosis of children is conveyed by milk or meat from bovine sources and is not true human tuberculosis. The success which has attended the immunization experiments of von Behring and Römer in Marburg are considered as supporting the author's view. During these experiments it has been found impossible to produce immunity against tuberculosis in cattle except by the use of tubercle bacilli of human origin. By this latter means over 1,000 cattle have already been immunized. The recent report of the German Imperial Health Office on the subject of bovine and human tuberculosis is believed also to furnish strong support for Koch's contention that there is a specific distinction between human and bovine tubercle bacilli. The author is experimenting with the blood serum of tuberculous cattle for the purpose of testing the possibility of immunizing man by the injection of such products. The author concludes as the result of his experiments and observations that human and bovine tuberculosis are distinct diseases and that man is susceptible to both.

Human and bovine tuberculosis contrasted (*British Med. Jour., 1904, No. 2293, pp. 1596, 1597*).—A brief statement is made of the preliminary announcement of the German commission regarding its investigations on tuberculosis. It is stated that 2 distinct forms of tubercle bacilli, the human and the bovine, must be recognized. In a vast majority of cases it is held that human tuberculosis is contracted from man, but that, on account of the possibility of the transmission of bovine tuberculosis to man, it would be unwise to do away with the precautions which have already been adopted in the treatment of tuberculous milk and meat.

Human and bovine tuberculosis, A. BORREL (*Rev. Vét. Toulouse, 29 (1904), No. 11, pp. 725–731*).—The literature bearing on this controversial question is briefly reviewed. The author believes that the experiments thus far reported do not add any weight to the opinion that human and bovine tubercle bacilli are distinct species. The facts observed may be more easily explained by assuming that the 2 forms of tuberculosis are due to the adaptation of the tubercle bacillus to different conditions in different organisms.

The suppression of tuberculosis, E. VON BEHRING, trans. by C. BOLDUAN (*New York: John Wiley & Sons, 1904, pp. 85*).—In this book a few articles by Professor von Behring on the subject of tuberculosis have been brought together and translated. The most important article is from a lecture delivered in Cassel.

The subjects discussed include the general suppression of tuberculosis, observations concerning the development of pulmonary tuberculosis in man and animals, suggestions concerning the hygiene of cow stables and the production of milk for infant feeding, synopsis of the methods of making protective inoculations of cattle in agricultural pràctice, and conditions concerning the distribution of protective virus. The author elaborates his views concerning the means of transmission of tuberculosis from man to man and animal to animal.

Experiments in immunization toward tuberculosis, P. BAUMGARTEN (*Berlin. Klin. Wchnschr., 41 (1904), No. 43, pp. 1124, 1125*).—Since 1902 the author in cooperation with Dr. Hegler has carried on experiments in immunizing cattle and rabbits toward tuberculosis.

In these experiments it was found that by the use of human tubercle bacilli cattle could be immunized against cultures of bovine tubercle bacilli which were fatal for control animals. This immunity has persisted for 2½ years without sign of diminution. No success was had with the same method, however, in immunizing rabbits, and this fact was attributed to the greater susceptility of rabbits to tubercle bacilli. Immunity in cattle toward bovine tubercle bacilli may be produced by a single subcutaneous inoculation with human tubercle bacilli. The author argues, therefore, that it is unnecessary to make a repeated intravenous inoculation with human tubercle bacilli, as has been recommended by von Behring and others.

Human tubercle bacilli, although highly virulent for guinea pigs, when inoculated subcutaneously into cattle produce no local tuberculous infection, nor do they remain demonstrable at that point as a result of any proliferation of tissue The result of vaccination is therefore not a mild infection with tuberculosis, but is in the nature of an inflammatory process. Human tubercle bacilli appear, therefore, to operate as a vaccine toward bovine tuberculosis

The author tested the properties of serum obtained from animals which had been immunized by his method. It was found that such serum produced no protective power toward tuberculosis. It is believed that a method of immunizing human beings may be devised upon the same basis by the use of bovine tubercle bacilli.

Tuberculosis of food animals as their most important defect, A. MAIER (*Ztschr. Fleisch- u. Milchhyg., 15 (1904), No 1, pp. 11–14*).—A general discussion of tuberculosis particularly from the standpoint of the meat inspector, with notes on methods of controlling this disease and on the utilization of meat affected to different degrees with tuberculosis.

Variations in the agglutination of tubercle bacilli, S. Arloing and P. Courmont (*Rev. Tuberculose, 1 (1904), No. 5, pp. 329–349*).—The purpose of the experiments reported in this article were to determine whether nonagglutinable tubercle bacilli may not become agglutinogenic and whether an agglutinating substance could be obtained by inoculating them into experimental animals. The dog was used as the exclusive experimental animal. Tubercle bacilli of human, bovine, and avian origin were employed in the experiments.

As a result of the extensive series of experiments carried out by the authors it was concluded that there are homogeneous agglutinable cultures of tubercle bacilli, and also others which are completely without the property of agglutinability. The origin of the cultures appears to have no influence upon their properties. Very often homologous serum is not particularly agglutinating toward the corresponding bacillus. All homogeneous cultures which were used proved to be agglutinogenic without regard to their origin. In other words, when inoculated into experimental animals they produced sera which agglutinated corresponding cultures of the bacilli.

There appears to be no necessary connection between the agglutinability and the agglutinogenic power of sera. Apparently the causes of variation in the agglutinability of tubercle bacilli can not be sought either in their origin, virulence, agglutinogenic power, or age of the cultures. For practical purposes, therefore, it appears that the absence of agglutinability is not a character which may be made use of for differentiating between the different types of tubercle bacilli.

The cure and prevention of bovine tuberculosis by subcutaneous injections of oil, T. B. Keyes (*Vet. Jour., 59 (1904), No. 352, pp. 201–208*).—Subcutaneous injections of olive oil have been tested by the author for the cure of tuberculosis in man. The oils selected for this purpose were of a high grade and thoroughly sterilized. Olive oil was preferred to other oils on account of its being comparatively nonirritant. The injections were made over the shoulder blades alternately.

The theory upon which this treatment is based is that during the course of tuberculosis the nutritive process in man and animal is at a low ebb and may be greatly supplemented by the use of oil. It is recommended that cattle affected with tuberculosis be similarly treated with quantities of linseed, cotton-seed, and sperm oil.

Fluorescence and precocious tuberculin reaction, D. Jacobsohn (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 15, pp. 713, 714*).—The author had previously noted that fluorescent rays of light have the power of checking the development of other pathogenic bacteria and the possibility of such an effect was studied under the influence of tubercle bacilli. Attention was called to the method of Marmorek in obtaining a precocious tuberculin reaction after inoculation with fluids suspected of being tuberculous. This method was utilized by the author for the purpose of studying the action of fluorescence on tubercle bacilli.

It was found in these experiments that tubercle bacilli, when rendered fluorescent, no longer give the characteristic rise of temperature as a reaction to tuberculin. From these experimental facts the author concludes that fluorescent light does not exercise any influence upon the tuberculin contained in the bacterial bodies, but that the absence of temperature reaction is probably due to the inhibitory power which fluorescent light exercises on tubercle bacilli in weakening their power of secreting toxin.

Homogeneous cultures of tubercle bacilli, Vasilescu (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 20, pp. 929–931*).—The author's method for obtaining homogeneous cultures of tubercle bacilli is briefly described. It was found that when properly prepared, the mixture when kept in an autoclave at a temperature of 120° C. suffered no coagulation. With cultures thus rendered perfectly homogeneous it was found possible to make a serum diagnosis for tuberculosis with the same ease as has been attained in the diagnosis of typhoid fever.

Extreme susceptibility of Arctic animals to tuberculosis, C. FRENCH (*Amer. Vet. Rev., 28 (1904), No. 1, p. 41*).—Attention is called to the fact that Arctic animals are peculiarly susceptible to tuberculosis. The author relates his experience with 20 wild swans (*Olor columbianus*) imported from the Arctic regions. These birds were subsequently sent to Europe, where they rapidly succumbed to tuberculosis.

Cow-pox lymph and tuberculosis, A. CARINI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 2, pp. 261–270*).—It is commonly considered that there is considerable danger of transmitting tuberculosis by means of lymph obtained from tuberculous cattle.

The author made a thorough study of this question, during which it was found that tubercle bacilli when placed in such lymph and kept at a temperature of 10 to 12° C. retain their virulence for at least 3 months, as shown by inoculation experiments with guinea pigs. The tubercle bacilli, however, gradually became attenuated under the influence of the glycerin in the lymph. Under ordinary conditions, however, it is concluded that the danger of the transmission of tubercle bacilli in lymph is very slight, since the lymph which comes from tuberculous cattle does not contain tubercle bacilli. Nevertheless, the author recommends that the precaution of not using tuberculous cattle for the production of lymph be still continued.

Tetanus cured by the method of expectant treatment, BERGEON (*Rev. Vét. Toulouse, 29 (1904), No. 11, pp. 737–739*).—Notes are given on a case of tetanus in a colt. The infection occurred through a castration wound. The author did not administer antitetanus serum or other specific treatment for tetanus, but merely combated the symptoms as they arose and administered nutriment per rectum. A perfect recovery took place.

The action of anthrax bacilli upon the toxin of tetanus, M. GARNIER and G. SABARÉANU (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 27, pp. 203, 204*).—The authors made a study of the effects of various micro-organisms upon toxins produced by other species. Particular attention was given to the effect of anthrax bacilli upon tetanus toxin.

It was found that tetanus toxin in which anthrax bacilli were cultivated became greatly attenuated after 12 to 14 days in an autoclave. The loss of the specific power of the toxin is not accompanied, however, with a loss of the injurious effects in experimental animals. It was found during these experiments that tetanus toxin which had entirely lost the power of producing tetanus was still capable of killing guinea pigs.

Vaccination of sheep for anthrax, O. BAIL (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 2, pp. 270–280*).—The method of immunization employed by the author consisted in the use of the lysin of the anthrax bacillus which was obtained from the sterilized fluid in the anthrax edema.

The use of this lysin is supposed to produce a corresponding antilysin in the body of the treated animal and thereby to confer immunity. Experiments in rabbits and sheep showed that these animals were in a large percentage of cases rendered immune, and that their serum in turn was capable of immunizing normal animals. This method differs from those previously employed in that living bacilli are not employed for inoculation.

Immunization against anthrax by the use of virulent cultures, J. A. GILRUTH (*New Zealand Dept. Agr., Div. Vet. Sci. Bul. 7, pp. 13*).—In a series of experiments which the author carried out on guinea pigs and other animals it was found that guinea pigs, rabbits, and sheep may exhibit a complete resistance to inoculation with large doses of virulent anthrax bacilli if these organisms are mixed with a larger quantity of another organism which is not pathogenic to the animals in question.

Death from anthrax is frequently delayed when the organism mixed with the anthrax is slightly pathogenic. The anthrax bacillus must be mixed with the other organism since if they are injected simultaneously in different parts of the body no

resistance is brought about. The resistance thus produced is temporary since animals which have withstood large injections of anthrax bacilli mixed with some other organism may succumb later to a small quantity of anthrax bacilli. The organism most extensively used by the author for mixing with anthrax is *B. enteritidis*.

The effect of corrosive sublimate in experimental anthrax infection in naturally immune animals, D. CALAMIDA (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 1, pp. 11–18*).—The author's experiments were carried out on dogs and chickens, both of which are generally known to possess a high immunity toward anthrax.

It was found in these experiments as already pointed out by Cadéac that the injection of nonfatal doses of corrosive sublimate one-half hour before inoculation with anthrax produces death as a result of anthrax infection in full-grown dogs which were otherwise immune toward the anthrax bacillus. Similar injections of corrosive sublimate did not have the effect of destroying the natural immunity toward anthrax in chickens. Experiments with digitalin showed that when this drug was injected after inoculation with anthrax and treatment with corrosive sublimate it counteracts the deleterious influence of corrosive sublimate. This action is attributed to the great hyperleucocytosis brought about by the digitalin.

The effect of corrosive sublimate is apparently due to its specific action upon the white blood corpuscles and the fact that chickens remain immune to anthrax even after receiving injection of corrosive sublimate, is attributed to the greater resisting power of their leucocytes.

Carbuncular diseases of animals, M. CADIZ (*Enfermedades carbunclosas de los animales. Santiago de Chile: Instituto Agricola, 1904, pp. 71, pls. 2, figs. 13*).—The author presents a general account of the symptoms, pathological anatomy, distribution, and treatment of anthrax and black leg of domesticated animals.

Actinomycosis, W. H. KELLY (*Rpt. New York State Dept. Agr., 10 (1902), pp. 194–198*).—The author discusses the nature of this disease together with an account of the means of infection, the symptoms of the disease, and approved methods of treatment.

Inoculation against African coast fever, C. E. GRAY (*Jour. Comp. Path. and Ther., 17 (1904), No. 3, pp. 203–205*).—After the publication of Koch's inoculation method for the prevention of this disease, the author tested the method on a large scale. It was found that inoculation repeated 10 or more times failed to produce immunity. Other striking instances were observed in which inoculation failed to protect the treated animals, and the author concludes, therefore, that the failure of Koch's method makes it necessary to combat the disease by means of dipping and quarantine.

Some observations and experiments in connection with tropical bovine piroplasmosis (east coast fever or Rhodesian redwater), A. THEILER and S. STOCKMAN (*Jour. Comp. Path. and Ther., 17 (1904), No. 3, pp. 193–203*).—Observations in South Africa have convinced the authors that infected fields may become free from infection after a lapse of 15 months or perhaps in some instances within a shorter period.

A test of the inoculation method proposed by Professor Koch was without satisfactory results. Inoculation repeated 6 or more times failed to produce any immunity to the disease. A number of dipping experiments were carried out with kerosene finely divided in water. The results of these experiments indicate that the disease is not materially checked by this method. Dipping experiments were also made with arsenical dips with or without the addition of Izal. The application of dips in badly infested areas apparently gives no guarantee against the further spread of the disease.

Foot-and-mouth disease, A. DECLERCK (*Rev. Agron. Lima, 1 (1904), No. 1, pp. 18–20*).—Brief notes are given on the etiology, symptoms, and treatment of this disease.

Croup in cows, P. GRUNTH (*Maanedsskr. Dyrlæger, 16 (1904), No. 2, pp. 33–47*).—The symptoms of this disease as observed by the author in various parts of Denmark are essentially those of bronchitis, combined with evidence of infection of other mucous surfaces, especially of the reproductive organs. In 42 per cent of the cases the lungs were affected, while in 9.3 per cent of the cases both the lungs and uterine membranes were involved. The disease appears to assume the form of a general catarrh.

Osteomalacia in cows, J. HÖYEM (*Maanedsskr. Dyrlæger, 16 (1904), No. 5, pp. 151–157*).—The symptoms of this disease are described in connection with notes on its distribution and etiology. In general the prognosis in cases of this disease are not favorable. Wherever the trouble appears the soil or feeding stuffs should be suspected as being deficient in mineral elements, and lime and phosphate should be added to the ration by way of treatment.

Bloody milk in cows, PUSCH (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 43, pp. 431, 432*).—In the author's opinion bloody milk in cows occurs much more frequently than is generally supposed. It is believed that a number of cases fail to be observed since the trouble persists only a short time after calving. In 2 cases which were studied by the author the disease could not be attributed to any injurious properties in feeding stuffs nor to inflammation of the udder. The cause of the trouble was, therefore, to be sought in general congestion.

A verminous disease of calves in the districts of Tegernsee and Miesbach, GASTEIGER (*Monatsh. Prakt. Tierh., 16 (1904), No. 2–3, pp. 49–92*).—The literature bearing on this subject is discussed in a critical manner.

The author had opportunity to study a number of outbreaks of this disease and detailed clinical notes are given on the progress of the disease in numerous cases. It was found as a result of these studies that in portions of Bavaria a verminous disease of an epizootic character prevails in sucking calves. The cause of the disease is *Ascaris lumbricoides*. The eggs of this worm are not found in the drinking water or in the feces of the cows. They are found, however, in large numbers in the bedding and about the stalls.

Calves become affected during the first few days after birth and apparently by direct ingestion of eggs which develop without an intermediate host. The disease appears most widespread at the age of 3 to 5 weeks. Notes are given on the symptoms, pathological anatomy, and diagnosis of the disease. Considerable benefit was derived from administering tartarus stibiatus, areca nut, and flores cinæ. As a prophylactic measure the author recommends that the feces of infected calves be burned and that strict disinfectant measures be put in operation.

Cattle poisoning by "Klimop" (Cynoctomum capense), D. HUTCHEON (*Agr. Jour. Cape Good Hope, 25 (1904), No. 4, pp. 398–401*).—A number of the cattle are reported as having been fatally poisoned by eating this plant. Feeding experiments with sheep indicated that from 1 to 2 lbs. of the plant are required to produce serious symptoms in an animal weighing 100 lbs. Decoctions of the leaves and stalks did not prove poisonous unless used in large quantities.

When animals are poisoned by this plant they show characteristic symptoms of spasms, which recur at frequent intervals. No specific is known against this form of poisoning. The author recommends the administration of purgatives to remove any unabsorbed portion of the poisonous plant and of chloral hydrate in combating the symptoms.

Researches in helminthology and parasitology, J. LEIDY (*Smithsn. Misc. Collect., 46, No. 1477, pp. 1–281*).—The numerous publications of Professor Leidy relating to animal parasites are presented in this volume in the form of abstracts which have been arranged and edited by J. Leidy, jr. A bibliography of the publications of Professor Leidy is appended to the volume.

Parasites as an aid in determining organic relationship, N. A. COBB (*Agr. Gaz. New South Wales, 15 (1904), No. 9, pp. 845–848*).—The presence of parasites may be used in throwing light upon the relationship between their hosts. Parasites may thus serve as an aid in discovering specific and generic relationships in following metamorphoses and in determining various problems of physiological chemistry, such as those connected with toxins and antitoxins.

The cat as a host of Tænia echinococcus, F. DÉVÉ (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 28, pp. 262–264*).—It was found possible by means of feeding experiments to infest cats with this parasite. Since, therefore, it has been shown that cats may become infested it is of considerable importance to remember this fact in the study of the distribution of contagion with echinococcus.

The structure of the intestinal epithelial cells of Distomum hepaticum, A. PRENANT (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 11, pp. 522–525*).—Brief notes are given on the histological details of structure of the epithelial cells of the intestines of liver flukes.

The common liver fluke in Hawaii, J. C. SMITH and D. L. VAN DINE (*Hawaii Sta. Press Bul. 11, pp. 7, figs. 10*).—The liver fluke is considered to be very prevalent in Hawaii, especially among cattle. It was found in 990 out of 3,376 cattle slaughtered in Honolulu, and in some localities the infestation seems to be even more extensive.

The life history of this pest is given together with descriptive notes on the worm in its different stages. In controlling the liver fluke it is recommended that infested cattle be slaughtered before the last stages of the disease develop. No drugs have given much success in treating the disease, although some good may derive from the use of tonics.

Lime and sulphur dip for maggots in sheep (*Jour. Bd. Agr. [London], 11 (1904), No. 7, pp. 422, 423*).—An experiment was made in dipping sheep with a lime-sulphur dip containing 25 lbs. sulphur per 12½ lbs. lime. A quantity of water was used sufficient to give a dark red color, and before using the liquid was diluted to 100 gal. The dip proved effective for sheep scab and did not materially injure the wool. Brief notes are also given on the prevalence of the maggots in sheep.

Lime and sulphur dip (*Agr. Jour. Cape Good Hope, 25 (1904), No. 3, pp. 325–330*).—A portion of a debate is presented as it took place in the legislative council of Cape Colony regarding the efficacy of lime and sulphur dip. The majority of the speakers believed that this dip is more effective than any other in the prevention of sheep scab, and it was urged that greater attention be given to preventing the use of imported dips not properly prepared. The bad results which have attended the use of some dips of this class have discouraged sheep raisers and led them to oppose the government sheep scab act.

Serum treatment in hog cholera, J. TORGERSEN (*Maanedsskr. Dyrlæger, 16 (1904), No. 1, pp. 1–4*).—The results obtained from an application of serum treatment in cases of this disease have not always been satisfactory. In the author's experiments 5 to 10 cc. of serum and 0.3 cc. of vaccine were used. After a few injections the affected animals were noticeably improved. Only 4 per cent of infected animals died after this treatment and none of the healthy vaccinated animals took the disease, although subsequently exposed to infection.

Swine fever, A. F. HARBER (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 8, pp. 737, 738*).—Hog cholera has recently appeared in Natal, and on account of the great economic importance of this disease notes are given on its symptoms, pathological anatomy, and treatment.

Experiments in treating cerebro-spinal meningitis (so-called Borna horse disease) with lecithin, H. RAEBIGER (*Deut. Tierärztl. Wchnschr., 12 (1904), Nos. 39, pp. 385–389; 40, pp. 397–402*).—The author presents a general discussion of this

subject and gives the results of numerous experiments carried out by veterinarians in different parts of Germany with regard to the curative power of lecithin in cases of cerebro-spinal meningitis. The number of injections of lecithin used varied from 1 to 11. This remedy has been used for the past 3 years to a considerable extent, but the results are not sufficiently satisfactory to consider lecithin as a specific against this disease.

Tsetse-fly disease among mules in the Sudan, A. S. HEAD (*Jour. Comp. Path. and Ther., 17 (1904), No. 3, pp. 206-208, fig. 1*).—Notes are given on the symptoms, post-mortem appearance, and etiology of this disease, especially as observed in mules.

Evolution of the Trypanosoma evansi, J. D. E. HOLMES (*Jour. Comp. Path. and Ther., 17 (1904), No. 3, pp. 210-214, pls. 2*).—The author presents a critical review of the bacteriological methods proposed by different authors for studying this organism and related species of parasites. Notes are also given on the appearance of the organism in its different stages of development.

Perforation of the small intestines in horses by Ascaridæ, FRANCKE (*Fortschr. Vet. Hyg., 2 (1904), No. 7, pp. 185-188, figs. 3*).—The literature relating to *Ascaris megalocephala* is critically reviewed, together with detailed notes on the pathological anatomy observed in a fatal case of infestation by this worm in which the walls of the small intestine were perforated. Numerous specimens of this worm were observed in the intestines and in the body cavity.

Glanders and farcy, FLINTOFF (*Orange River Colony, Dept. Agr., Farmers' Bul. 1, pp. 8*).—The symptoms, methods of contagion, development, and post-mortem appearance of this disease are described, and references made to the government regulations regarding glanders.

Clinical notes, J. MAREK (*Ztschr. Thiermed., 8 (1904), No. 6, pp. 434-439*).—Notes are given on the occurrence of various forms of colic, intestinal obstructions, and similar troubles in horses, with an account of the most successful methods of treating these diseases.

Three common diseases affecting the horse's foot, H. C. WILKIE (*New Zealand Dept. Agr., Div. Vet. Sci., Bul. 8, pp. 11*).—Notes are given on the symptoms, pathological anatomy, and treatment of laminitis, sand crack, and navicular disease.

Experimental investigation of rabies, E. BERTARELLI and G. VOLPINO (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 1, pp. 51-58*).—The filtration of rabies virus was studied with especial reference to its attenuation by this means. It was found that rabies virus could be passed through a Berkefeld filter under a pressure of 3 or more atmospheres, but that not all of the virus could be forced through the filter. The material on the filter and in the filter always retained a certain degree of virulence. The authors conclude, therefore, that the organism of rabies must exist in different forms, some of which are of sufficient diameter to prevent their passage through a Berkefeld filter.

The means by which rabies virus reaches the salivary glands in dogs, E. BERTARELLI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 2, pp. 213-221*).—In accounting for the fact that rabies virus is found in considerable quantity in the salivary glands of dogs, 3 courses have been assumed as a possible means by which the virus reaches this position, viz, lymphatic system, blood circulation, and the nerves. The author's experiments were carried out on healthy young dogs, which were inoculated with rabies virus of known virulence. The technique of the experiments was arranged so that only one of the organic systems mentioned could possibly be concerned in the localization of the virus in the salivary glands. This was found to be easy of accomplishment by merely shutting off the blood supply or lymphatic supply or by severing the nerves which are distributed in the gland.

As a result of these experiments it was shown conclusively that virus of rabies reaches the submaxillary and probably other salivary glands only through the medium

of the nerves and can not otherwise occur. The author's experiments were not considered sufficiently numerous to make it certain that this conclusion will be found to be true without any exception. The results thus far obtained, however, indicate the importance of the author's conclusion.

Facts and experiences concerning rabies, C. NICOLLE and J. CHALTIEL (*Ann. Inst. Pasteur, 18 (1904), No. 10, pp. 644–653*).—Notes are given on the occurrence of rabies in *Herpestes ichneumon* and also on the virulence of the salivary glands in rabbits inoculated in the brain with fixed virus.

As a result of these studies which were carried out on 9 rabbits it was found that the salivary glands were virulent in 2, nonvirulent in 6, while in the ninth case the result is uncertain. Similar experiments on rats showed that all gray or white rats may be successfully inoculated with rabies under the dura mater or in the anterior chamber of the eye. Inoculation with rabies virus intramuscularly, however, gave negative results. The salivary glands of rats inoculated with rabies were virulent for rabbits in 2 out of 3 cases.

Pilocarpin in the treatment of rabies and other infectious diseases, P. REMLINGER (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 28, pp. 272, 273*).—The animals used in experiments conducted by the author were rabbits and guinea pigs. It was found that they were capable of withstanding doses of 300 gm. of pilocarpin without any harmful results. When much larger doses were employed an intense perspiration was induced, together with digestive and respiratory disturbances. It was shown by experiments that in vitro the pilocarpin did not exercise any attenuating action upon rabies virus. Likewise in rabbits and guinea pigs inoculated with the rabies virus and subsequently treated daily with pilocarpin from the moment of inoculation until the first appearance of the symptoms of rabies, the incubation period was the same as in control animals. No effect was observed from a similar use of pilocarpin in treating experimental animals inoculated with fowl cholera and with the toxin of diphtheria.

The hair-follicle mite of dogs and its treatment with formalin, K. SCHJEFLO (*Maanedsskr. Dyrlæger, 16 (1904), No. 4, pp. 97–115*).—The symptoms of skin disease produced by this mite in dogs are outlined and notes are given on the distribution and different forms of the disease as well as on the various lines of treatment which have been tested. These include the use of creosote salve, kerosene oil, carbolic acid, Peruvian balsam, creolin, etc.

The author made a number of experiments with solutions of formalin and found that this remedy gave better results than any other which had been tested. As a rule, 2 to 3 per cent solutions of formalin could be used without any injurious effects.

Exudative typhoid or plague of fowls, N. G. TARTAKOVSKI (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), Nos. 7, pp. 545–575; 8, pp. 617–666*).—An elaborate review is presented of the literature relating to this subject, together with notes on its distribution in different countries.

The disease under discussion is considered as identical with pseudo-cholera of fowls, infectious peritonitis, new fowl plague, cyanolophia, etc. An account is given of the extensive outbreaks of this disease in Italy, Austria, and parts of Germany, together with notes on the symptoms, course, and etiology of the disease and methods which have been adopted for controlling it. In general, however, the results obtained with combative measures have not been satisfactory.

It has been shown that the disease may be transmitted to certain species of wild birds and may possibly be transmitted to some extent by such species. Notes are given for the purpose of furnishing data for a differential diagnosis between this disease and fowl cholera, roup, septic enteritis, coccidiosis of the intestines, and apoplectiform septicemia.

AGRICULTURAL ENGINEERING.

Progress report of cooperative irrigation investigations in California, S. FORTIER (*U. S. Dept. Agr., Office of Experiment Stations Circ. 59, pp. 23*).—This circular gives the terms of the agreement under which cooperative investigations of this Office and the State Board of Examiners are carried on in California, and summarizes the work there along the following lines: "(1) Description of plants in use, (2) field tests of pumping plants in operation, (3) laboratory tests of typical pumps, and (4) duty and value of water under pumping plants. The first three lines have been in charge of J. N. Le Conte, of the University of California, assisted by A. J. Turner; and F. H. Tibbetts has collected a part of the data pertaining to the last line."

Tests of a number of pumping plants are reported which show that the cost of raising enough water to cover one acre of ground to a depth of 18 in. to a height of 30 ft. varied from 90 cts. to \$3.60. Laboratory tests of the efficiency of pumps under different heads and speeds showed that the highest efficiency was obtained with a speed of 893 revolutions per minute and a head of 40.6 ft. It was also found that with a lift of 40 ft. efficiency increased as the pump was placed nearer the water supply.

Data collected from 12 owners of pumps regarding the amount of water used and the cost of raising it show an average depth of 1.24 ft. of water applied at an average cost of \$6 per acre.

In the studies reported the total annual evaporation at Tulare was 74.68 in., at Pomona 66.62 in., and at Calexico 108.23 in. In all cases the greatest evaporation occurred during the months of June, July, and August.

In a study of the influence of temperature on evaporation it was found that at 89.2° F. evaporation was almost 10 times (3.92 in. weekly) as great as at a temperature of 55.5° (0.42 in. weekly).

A comparison of methods of applying water showed that much less water was lost when it was applied in deep furrows than when applied by means of surface flooding or shallow furrows. A comparative examination of irrigated and unirrigated fruits gave results favorable to the former.

Report of the irrigation engineer, B. P. FLEMING (*Wyoming Sta. Rpt. 1904, pp. 47-51*).—A summary account is given of the work of the year in this department, especially that relating to seepage and return waters on the Laramie River, which was done in cooperation with this Office, and studies of the water requirements of potatoes which have been carried on at the station for several years.

Report of progress of stream measurements for the calendar year 1903, J. C. HOYT (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 98, pp. 313, map 1*).—This is part 2 of the series of 4 papers (97–100) which constitute the report of progress in stream measurements for the calendar year 1903 (E. S. R., 16, p. 721). Parts 1 and 2 of this report contain data collected from the territory east of the Mississippi River, part 2 being confined to the southern Atlantic, eastern Gulf of Mexico, and eastern Mississippi drainage.

Report of progress of stream measurements for the calendar year 1903, J. C. HOYT (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 99, pp. 422, map 1*).—This is part 3 of the series of 4 papers (97–100) which constitute the report of progress in stream measurements for the calendar year 1903. Parts 3 and 4 of this report are devoted to data collected from the territory west of the Mississippi River, part 3 dealing with western Mississippi River and western Gulf of Mexico drainage.

The underground waters of Gila Valley, Arizona, W. T. LEE (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 104, pp. 71, pls. 5, figs. 9*).—"In this report there is presented all of the available information regarding the geology of the superficial formations in Gila Valley between The Buttes, 12 miles east of Florence, and

the junction of Gila and Salt rivers, a district which lies mostly within the Pima Indian Reservation. This investigation has been made for the purpose of ascertaining the amount of water available for pumping, for irrigation by the Indians, and the area in which such waters may be had."

The paper reviews previous investigations, describes the geographic and other physical features of the region, and gives data regarding wells, return waters, and underflow, discussing incidentally the economic condition of the Indian tribes living in this region as affected by the water supply.

The water powers of Texas, T. U. TAYLOR (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 105, pp. 116, pls. 17, figs. 32*).—This paper contains "a résumé of such data regarding water powers in the State of Texas as are at present available."

Water powers of Alabama, with an appendix on stream measurements in Mississippi, B. M. HALL (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 107, pp. 253, pls. 9, figs. 9*).

British sewage works, M. N. BAKER (*New York: Engin. News Pub. Co., 1904, pp. 149*).—Descriptions are given of 24 existing municipal sewage works inspected by the author in 1904, of the following classes: (1) 11 employing contact beds for final treatment; (2) 5 employing percolating filters for final treatment; (3) 5 sewage farms, and (4) 3 chemical precipitation works. Appendixes give notes on a sewage settling and screening plant at Wiesbaden, settling tanks at Frankfort-on-Main and the sewage farms of Paris, and definitions or brief descriptions of typical processes of sewage treatment.

It was found that chemical precipitation is rapidly giving way to plain sedimentation and to septic tanks. "Sewage farming has by no means come to an end, although in many instances it is being abandoned as rapidly as local circumstances will permit. Not a little of the apparent failure of sewage farming has been due to the faulty methods employed as preliminary to the application of sewage to the land.

"Where the land available for sewage farming is defective in quality or deficient in quantity it has been necessary to resort to a preliminary process of sedimentation, chemical precipitation, or some method of filtration, and this necessity has furnished the opportunity for exploiting the conceits of visionaries and of the proprietors of a multitude of patented processes of sewage treatment. Most of these processes have proved either futile or ruinously expensive, but too often the condemnation for their failure has been heaped on sewage farming instead of on the preliminary treatment."

The treatment of septic sewage, G. W. RAFTER (*New York: D. Van Nostrand Co., 1904, pp. 137*).—This is a brief summary of the more important developments in the treatment of sewage, with indications as to preferable methods of treatment.

The purification of sewage, C. DUNCAN (*Agr. Students' Gaz., n. ser., 12 (1904), No. 2, pp. 41-46*).—This article discusses the bacteriological purification of sewage, describing three experimental systems installed for the Worcestershire County Council at Malvern Wells.

A high-grade sewage farm (*Amer. Cult., 66 (1904), No. 51, p. 5*).—The successful and profitable use of the sewage of Pasadena, California, on a walnut orchard is described.

The functions of various types of bacteria in the purification of sewage, with some methods for their quantitative determination, H. W. CLARK and S. DE M. GAGE (*Engin. News, 53 (1905), No. 2, pp. 27-31*).—This is a report based upon investigations made at the Lawrence Experiment Station of the Massachusetts State Board of Health. The various reactions involved in the bacterial purification of sewage are described, and observations on the tendency of the sand from filters to induce denitrification, and the power of bacteria in sewage effluents and sands from sewage filters to produce ammonia and nitrites in nitrate solutions are reported; and methods of determining the ammonifying, denitrifying, nitrogen-liberating, and

liquefying power of bacteria are described, with discussions of the accuracy of these methods and the application of biochemical methods to the study of sewage and the effluents from sewage filters.

"The chemical changes which take place in the sewage in the process of purification may be divided into three groups: (1) putrefaction—that is, the breaking down of the complex organic matter into simpler forms; (2) nitrification and oxidation—that is, the oxidation of the nitrogenous matter into nitrites and nitrates, and of carbonaceous matter into carbonates; (3) denitrification—that is, the breaking down of nitrates and nitrites into ammonia and free nitrogen.

"These three processes probably all go on to a greater or less extent in sewage filters of all the various types. If a filter is so constructed and operated that oxidizing processes are active throughout the entire depth, the reduction of nitrates is prevented and practically all the nitrogen in the applied sewage will appear in its effluent. If, however, the construction and operation of a filter is such that both oxidizing and reducing actions occur, much nitrogen will be lost. The effluents of intermittent continuous filters in good operation contain practically all the nitrogen applied, while the effluents of contact filters in good operation show a large disappearance of nitrogen. From these results we should conclude just what is shown by the biochemical examination of the effluents of these various classes of effluents. It was found that the effluents from the contact filters, in which a considerable amount of reducing action takes place, showed denitrifying and nitrogen-liberating coefficients many times greater than those obtained for the effluents of the trickling filters in which conditions are always favorable for oxidation and nitrification.

"The effluents of intermittent sand filters in good operation also contain a large portion of the nitrogen applied. During the cold weather, however, nitrification may become inert in filters of this type, and while the effluents may remain fairly good in appearance, free ammonia and low nitrates will be given, combined with a considerable loss of nitrogen. In the biochemical examination of the effluents from sand filters located out of doors it was found that during the winter those filters which were giving unsatisfactory purification, as shown by small amounts of nitrates in the effluents, showed, as would be expected, great power to reduce nitrates and to liberate nitrogen, whereas in summer, when nitrification is active, these powers are very slight or entirely absent from these filters.

"Studies of sands from filters in which nitrification was active and from others in which nitrification was not active show that the sands from the latter filters are able to induce a rapid and complete reduction of large amounts of nitrates, while sands from filters which are actively nitrifying do not cause this denitrification, and, further, studies of the bacteria in these sands and in the effluents from these filters show that a very considerable portion of the bacteria in the filters in which nitrification is not active are able to reduce nitrates to nitrites and ammonia quite readily, while the reverse is true of the bacteria from filters in which nitrification is active.

"The ordinary methods of bacterial analysis do not yield information concerning the part which the various types of bacteria play in the process of purification. The present studies have been devoted to finding methods by which these functions may be determined and to the expression of these functions in such a manner that they may yield this information. In order to be of the most value it has been found that the determination of these functions must be approximately quantitative. Methods have been devised for the determination of the total power of the bacteria in a sample to produce ammonia from organic matter (ammonifying coefficient); of their power to reduce nitrates (denitrifying coefficient), and of their power to liberate nitrogen (nitrogen-liberating coefficient.) So far the methods have been applied only to sewage and to the effluents of sewage filters, but they are also directly applicable to the study of the conditions of bacterial life in the material of the filters themselves."

Biennial Report of the Department of Highways of the State of California, 1903-4 (*Bien. Rpt. Dept. Highways California, 1903-4, pp. 34, pls. 2*).—This report summarizes the status of road improvement in various counties of the State, giving special attention to the use of cheap asphaltic oil roads which now cover over 2,000 of the 45,000 miles of roads in California, and the use of which has increased the activity of the various counties of the State in the improvement of their roads.

It is shown that about $2,000,000 are now spent annually in the State for highway work. The form of a law which closely resembles the New York State aid law, and which is recommended for enactment by the California legislature, is given.

Oiled roads of California (*California Dept. Highways Bul. 2, pp. 41, figs. 5; reprinted in Engin. Rec., 50 (1904), Nos. 23, pp. 663-666; 25, pp. 709-711; 26, pp. 752-754; 27, pp. 780-783*).—"It is the purpose of this bulletin to present all the available data relative to oiled roads in California, and also to show the results obtained by the application of crude oil to the various soils and roadbeds within the State."

The experience of 40 counties, extending from Tehama in the north to San Diego in the south, is summarized and deductions are drawn from the data "which will give a basis of work to those desiring to enter upon or to continue this important improvement to the highways of the State."

Contributions from the agricultural machine and implement testing station, Halle (*Ber. Physiol. Lab. Landw. Inst. Halle, 1903, No. 17, pp. 1-61, figs. 43*).—Brief illustrated accounts are given of tests of a large number of agricultural machines and implements, including hoof shears, harrows, mowing machines and attachments, plows, potato diggers, brakes and couplings, machine weeders, milk separators, hay rakes, and beet harvesting machine. Some account is also given in each case of the methods of testing the efficiency of the different machines and implements.

Appliances and methods used in testing agricultural machines, A. NACHTWEH (*Fühling's Landw. Ztg., 53 (1904), Nos. 1, pp. 19-21; 3, pp. 94-103, figs. 13; 6, pp. 222-227, figs. 4; 8, pp. 303-311, figs. 6; 11, pp. 418-422, figs. 2*).

Tests of grain pressure in deep bins at Buenos Ayres, Argentina, E. LUFFT (*Engin. News, 52 (1904), No. 24, pp. 531, 532, figs. 7*).—The results of observations on circular bins 54.8 ft. deep and 11 ft. 3 in. and 23 ft. 10 in. in diameter, with a special form of pressure gage, are reported.

In the design of the pressure gage, which is quite similar to that described by J. A. Jamieson (E. S. R., 15, p. 935), "the leading idea was to replace a small section of the bin wall by a flexible rubber surface, so that the grain pressure could act through this surface upon a counterbalancing column of fluid, as, for example, a mercury column. . . . The pressure gage comprises a cast-iron body or pressure chamber, open on one side, which side is then covered over by a thin sheet of rubber. This pressure chamber is embedded in the bin wall in such a manner that the surface of the rubber membrane falls in the plane of the bin wall.

"Care was taken, in putting the membrane in place, that the rubber sheet should not be stretched over the mouth of the pressure chamber, but should rather have some slack. Two gas pipes pass from the pressure chamber through the bin wall; one of them leads to a U-tube containing a mercury column, while the other serves as air vent during the process of filling the chamber with the liquid used. Glycerin was used at first, though later water was also experimented with. Since the two gas pipes turned off upward from the pressure chamber and were filled with glycerin at the beginning of the test, they served to put the rubber membrane under some initial pressure from the inside.

"By this means it was made sure that the rubber surface would be slightly convex toward the inside of the bin. The intention was to avoid any possible concavity of the membrane; for, if the rubber surface were concave, part of the load on it would be carried by the membrane acting as a suspension structure, instead of the

entire grain pressure being transmitted to the fluid. This initial pressure, of course, which required counterbalancing by a certain amount of grain placed in the bin, was taken due account of in the computations."

The results of observations during the filling and emptying of the bins with wheat and corn are shown diagrammatically. These show that, while the measurements with the pressure gage are of doubtful value for decreasing pressures, they afford a good indication of degree of pressure increase during emptying. There was a "very satisfactory agreement between the calculated and the observed pressures."

MISCELLANEOUS.

Statistics of land-grant colleges and agricultural experiment stations, 1904, Marie T. Spethmann (*U. S. Dept. Agr., Office of Experiment Stations Circ. 61, pp. 9*).—This is a summary of the statistics to be published later in the annual report of this Office. The total number of institutions maintaining courses in agriculture is 63, and the total number of experiment stations 60. The total income of the stations during 1904 was $1,508,820.25, of which $719,999.67 was received from the National Government.

In addition to this the Office of Experiment Sta ions had an appropriation of $175,000, including $15,000 each for the Alaska, Hawaii, and Porto Rico Stations, $20,000 for nutrition investigations, $65,000 for irrigation investigations, and $5,000 for farmers' institutes. The stations employed 795 persons in the work of administration and inquiry, of which 414 do more or less teaching in the colleges with which the stations are connected. During the year the stations published 393 annual reports and bulletins, which were supplied to nearly 700,000 addresses on the regular mailing lists.

Annual Reports of the Department of Agriculture, 1904 (*U. S. Dept. Agr. Rpts. 1904, pp. CXVII+560*).—This is made up of the reports of the Secretary and heads of Bureaus. The various reports are also issued as separates.

Seventeenth Annual Report of Alabama Station, 1904 (*Alabama Sta. Rpt. 1904, pp. 29*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1904; and reports of the director and heads of departments on the different lines of station work during the year. A list of certificates issued to nurserymen is included in the report of the horticulturist.

Seventeenth Annual Report of Georgia Station, 1904 (*Georgia Sta. Rpt. 1904, pp. 10*).—This contains a report of the commissioner of agriculture and president of the board of directors; a report of the director on the work of the station during the year; and a financial statement for the fiscal year ended June 30, 1904.

Eighteenth Annual Report of Nebraska Station, 1904 (*Nebraska Sta. Rpt. 1904, pp 20*).—This includes the organization list of the station; a rather detailed account of the station work during the year; and a financial statement for the fiscal year ended June 30, 1904.

Sixteenth Annual Report of New Hampshire Station, 1904 (*New Hampshire Sta. Bul. 115, pp. 159-177*).—This contains the organization list of the station; a financial statement for the year ended June 30, 1904; and brief reports of the director and heads of departments. The report is also published as a part of the twenty-seventh report of the New Hampshire College of Agriculture and Mechanic Arts, pp. 247-264.

Director's Report for 1904, W. H. Jordan (*New York State Sta. Bul. 260, pp. 493-512*).—This is a somewhat detailed review of the different lines of station work during the year, with a list of the bulletins published.

Seventeenth Annual Report of New York Cornell Station, 1904 (*New York Cornell Sta. Rpt. 1904, pp. XXXV+197*).—This includes the organization list of the station, reports of the director and heads of departments; a financial statement for

the fiscal year ended June 30, 1904; and reprints of Bulletins 212-220 on the following subjects: Cooperative records of the cost of producing eggs (E. S. R., 15, p. 603); methods of milking (E. S. R., 15, p. 712); the ribbed cocoon maker of the apple (E. S. R., 15, p. 880); the grape leaf-hopper (E. S. R., 15, p. 980); spraying experiments: I. Spraying for wild mustard (E. S. R., 15, p. 1085); II. Dust or powder sprays (E. S. R., 15, p. 1089), an outline of cooperative demonstrations and tests for 1904 (E. S. R., 15, p. 1136); spray calendar (E. S. R., 15, p. 1093); onion blight (E. S. R., 16, p. 170); diseases of ginseng (E. S. R., 16, p. 271); and the utilization of skimmed milk in feeding pigs (E. S. R., 16, p. 295).

Fourteenth Annual Report of Wyoming Station, 1904 (*Wyoming Sta. Rpt. 1904, pp. 86*).—This includes the organization list of the station; a report of the director giving a review of the work of the station during the year; abstracts of Bulletins 59-62 of the station; a financial statement for the fiscal year ended June 30, 1904; and reports of the heads of departments, parts of which are noted elsewhere.

American agriculture, S. STRAKOSCH (*Amerikanische Landwirtschaft. Vienna: W. Frick, 1905, pp. 187, pl. 1, figs. 56*).—In this volume the author presents an account of observations and studies made during a tour throughout the United States. Particular attention was given to a study of the economic aspect of agricultural industries, types of farms, animal husbandry, fruit, grain elevators, beet-sugar industry, and the organization of this Department and the agricultural experiment stations. A large amount of literature relating to American agriculture was collected, and in all points the author's views reflect quite accurately the agricultural conditions of America.

Agricultural experiment stations in foreign countries, A. C. TRUE and D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Bul. 112, rev. ed., pp. 276*).—In this revision of Bulletin 112 of the Office (E. S. R., 14, p. 304) are incorporated changes based upon information secured directly from the officers of the stations, and also accounts of about 75 stations not included in the original bulletin.

Report on investigations relative to the profitableness of Swiss agriculture in 1903 (*Landw. Jahrb. Schweiz, 19 (1905), No. 1, pp. 65; Ann. Agr. Suisse, 6 (1905), No. 2, pp. 29-95*).—The harvests in 1903 were appreciably above the average. Nevertheless the net returns did not exceed 4 per cent of the capital invested.

The teaching of agriculture in the rural common schools, A. C. TRUE ET AL. (*U. S. Dept. Agr., Office of Experiment Stations Circ. 60, pp. 20*).—This report of the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations has already been noted in a summary of the proceedings of the association (E. S. R., 16, p. 430).

The organization of agriculture, E. A. PRATT (*London: John Murray, 1905, pp. 443*).—This book reviews the different lines of cooperation in agriculture in European countries, the United States, Argentina, Canada, Australasia, and Japan.

Accessions to the Department Library, 1904 (*U. S. Dept. Agr., Library Buls. 50, pp. 62; 51, pp. 56; 52, pp. 45; 53, pp. 66*).

NOTES.

Arkansas Station.—Further pig-feeding trials with cotton-seed meal are under way at the station, the object being to discover if possible a method of treatment which will neutralize or diminish the toxicity of cotton-seed meal for these animals. Two such tests have been completed. Reduction of the oil content by treatment with gasoline gave no diminution in toxicity of the meal. Fermenting or souring cotton-seed meal preliminary to feeding, a method which has been lately exploited in some of the farm journals, also proved entirely ineffective. Aqueous extracts and their residues of cotton-seed meal are now being tested.

California University and Station.—Professor Hilgard, director of the station, has been granted a year's leave of absence.

The following appropriations have been made for the college and station: $150,000 for the purchase and equipment of a university model farm and agricultural school; $30,000 for a pathological experiment station for southern California for the investigation of plant diseases; $20,000 for investigations of pear and walnut blight and diseases of grapes; $12,000 for farmers' institutes; $10,000 for investigations for the purpose of increasing the yield and gluten content of wheat; $5,075 for rehabilitating the Santa Monica Forestry Station, which had suffered from fire; $4,000 for the poultry station, and $17,000 for printing. An appropriation of $150,000 for an agricultural building failed to receive the signature of the governor.

Colorado College and Station.—The State legislature has appropriated $30,000 for the college and station for the years 1905–6. Of this sum $4,000 is to be expended annually in supplementing and extending the work of the college; $5,000 for investigations in live stock; $1,500 for experiments with grain, forage crops, and grasses; $500 for experiments with sugar beets, potatoes, and other root crops; and $4,000 for the purpose of organizing and conducting a farmers' institute annually in each agricultural county of the State.

At the instance of the board of agriculture a bill has also been passed which prevents members of the board from receiving per diem compensation in the future. The members of the board in general have felt that their interest in the college was more than that shown by the amount of per diem received, and that the fact of receiving a per diem gave a wrong interpretation of their motives and hampered their efforts.

Connecticut State Station.—T. B. Osborne, who has been studying the composition and constitution of the vegetable proteids for many years at this station, has received another grant from the Carnegie Institution for the continuance and expansion of his work.

Delaware College.—The college has received a State appropriation of $15,000, the greater part of which will probably be expended in building a drill hall and gymnasium.

Florida University and Station.—A bill before the State legislature provides for the appointment of a board of regents to have charge of all the educational institutions of the State, including the university and the experiment station. This board would replace the present boards of the various institutions, and centralize the management in the hope of bringing about greater harmony and building up a stronger educational system in the State. The board is to be composed of 15 members, appointed by the governor, 5 members for each of the 3 Congressional districts, no member to be appointed from a town in which one of the institutions affected by the bill is

located. The measure has been favorably reported by the committees in both branches of the legislature. It is strongly supported and it is thought will pass.

Georgia Station.—The station has made arrangements to conduct experiments in irrigation on a small scale the coming season. A piece of land has been prepared and a small reservoir constructed which will be supplied with water by pumping, using a gasoline engine for the purpose. A variety of field and garden crops will be grown for the experiment.

Kansas College and Station.—G. C. Wheeler, assistant in feeding experiments, has resigned to take charge of a large stock farm near Kansas City.

Maryland Station.—Practical tests are being made at the station of the von Behring method of immunization of cattle against tuberculosis. The work was begun April 10, and is being conducted by Dr. S. S. Buckley, the veterinarian of the station, and Dr. Wilfried Lellman, professor of pathology of the New York-American Veterinary College.

Minnesota University and Station.—The State legislature has restored the financial control of the university, including the experiment station, to the board of regents. For over two years the institution has been under the management of two boards; the board of regents having charge of all educational matters including the regulation of salaries, and the State board of control having charge of the financial management and the purchasing of all of the supplies for the institution. This dual management has not proved satisfactory in practice. The new law provides for a separate purchasing agent for the university under the management of the board of regents, and makes it a penal offense for the institution in any way to exceed its appropriations.

Among the appropriations granted were the following items for the agricultural department of the university: Auditorium, to form a part of the contemplated main building, $50,000; purchase of land, $10,000; enlargement and equipment of dining hall, $10,000; purchase of live stock, $9,000; plant-breeding experiments, $8,000; soil investigations, $2,000; insectary, $2,500; improvement of grounds, $1,000; steel water tank and hose connections, $6,500. The university received among other items an appropriation of $350,000 for a new main building, making, with the insurance from the old building which was burned in September, 1904, a little over $400,000 available for this purpose. The legislature granted about $100,000, exclusive of appropriations for substations, for buildings, lands, and maintenance of the agricultural department. Two years ago the legislature provided for the construction of an administration building costing $175,000. The erection of this building was delayed until more funds could be received, so that the auditorium as originally contemplated could be included as a part of this structure.

Montana Station.—James Dryden, poultryman, has resigned to accept a position with the Cyphers Incubator Company, of Buffalo, New York. He will have charge of a poultry plant at East Aurora, New York, and expects to do experimental work.

North Carolina Station.—The recent establishment of a branch station or test farm for trucking crops in Pender County makes four such branch stations in the State, the older ones being located in Edgecombe, Iredell, and Transylvania counties, and used in studying general farm crops, mountain crops, and fruits.

Oklahoma College.—A special course in agriculture for rural school teachers is offered for the first time during the spring term.

Pennsylvania College and Station.—The appropriation bills, as passed by the legislature which has just adjourned, provide $150,000 for the completion of the agricultural building, $21,500 for the extension of the heat, light, and power plant, $30,000 for the maintenance of agricultural courses, $10,000 for the maintenance of the experiment station, $2,500 for tool and poultry houses, and $139,456.33 for general maintenance.

Porto Rico Station.—Several farmers' institutes held by the experiment station men have attracted considerable attention and are considered very successful as a beginning. The local press has shown an appreciation of the benefits to be derived from them and urges that more institutes be held. An insular horticultural society has been formed with a good following of intelligent planters, which will hold semiannual meetings at different towns. The Territorial legislature has passed a horticultural quarantine law applying to the introduction of seeds, plants, etc., with an appropriation of $500 for carrying out its provisions; and also a fertilizer law imposing a tax of 25 cts. a ton. The execution of both of these laws has been placed in the hands of the experiment station. The legislature also made an appropriation of $10,000 for the promotion of agriculture, with special reference to fiber plants, which is placed in the hands of the Territorial government.

The station has secured possession of the old Spanish station comprising about 7 acres of land adjoining the Federal station. This tract has the beginning of a good irrigation system upon it.

South Carolina College and Station.—John Michels, formerly of the Michigan Station, who has recently been taking advanced work at Wisconsin University, has been elected associate professor of animal husbandry at Clemson College and in charge of animal husbandry and dairying in the station. He will enter upon his duties about July 1. J. M. Burgess, a graduate of the college, has accepted the position of assistant in the division of animal husbandry, made vacant by the resignation of B. H. Rawl.

Tennessee University.—A barn 40 by 46 ft. has been built for the horticultural department, which provides ample room for tools and horses, a seed room and a potting room. During the year a small propagating house will be built.

Vermont University.—A station of the United States Weather Bureau is to be established at Burlington, on the university grounds, upon a lot which the trustees have voted to deed to the Government for this purpose. It is expected that four officials will be connected with the station—a director, two observers, and a student assistant; and that the director will deliver lectures at the university. The proposed building, which it is expected will be erected early in the summer, is to be 36 by 46 ft., built of brick, and to consist of two stories with a basement, and a tower of moderate height. It will be used as a dwelling house by the director, as well as for meteorological work.

Attempts are being made at the station to develop varieties of potatoes resistant to diseases. Seed tubers of several of the most promising European varieties imported by Professor Jones and various wild species brought back from Mexico by Mr. Pringle will be used in this work.

Virginia Station.—The station, through its department of bacteriology, which is in charge of Meade Ferguson, has undertaken to distribute inoculating material for various leguminous crops to farmers in Virginia. A charge of 25 cts. per acre is being made for the material, which is being sent out for experimental purposes. The station was prompted to undertake this work in order that the merits of soil inoculation might be tested in all parts of the State, and also that farmers might secure inoculating material at reasonable rates.

Wyoming University.—The legislature has provided for the establishment of a State board of horticulture, of which the professor of botany and zoology in the university is made an ex-officio member, and also for the licensing of nurseries doing business in Wyoming, and for the appointment of inspectors to examine nursery stock shipped into the State. No regulations of this kind have previously existed in the State.

U. S. Department of Agriculture.—The following appointments have been made in the Irrigation and Drainage Investigations of this Office: S. M. Woodward, of the University of Iowa, irrigation engineer, with headquarters in Washington, D. C.; F. C. Herrmann, irrigation engineer in charge of the Cheyenne office; W. B. Gregory,

irrigation engineer in charge of irrigation investigations in the Gulf States; C. J. Zintheo, of Iowa Agricultural College, to take charge of work in agricultural machinery; J. T. Stewart, drainage engineer; W. E. Herring, expert assistant in drainage investigations; A. P. Stover, to take charge of irrigation work in Oregon, and E. R. Morgan, resident agent in Utah.

The following States have made appropriations for carrying on work in cooperation with the irrigation and drainage investigations: California, Nebraska, Nevada, and Utah.

Government Farm at Morendat, East Africa.—An account of the British East African Government Farm at Morendat is given in a recent issue of *Mark Lane Express.* The farm is situated about 6,000 ft. above the sea, and the climate is said to be quite like that of an English summer, the temperature being about 70° in the daytime and falling to 45° at night. Shipments of various breeds of cattle, sheep, and poultry have been sent out to the farm, breeds being selected which were considered likely to cross best with the native stock.

The chief object of the government is to show by experiments with imported stock how the native cattle, sheep, and goats can be improved by crossing and by distributing young male animals to assist in the work of grading up the live stock of the country. The pure-bred animals are reported to have done exceedingly well, and the first crosses from native cows, ewes, and goats to be very promising. A second consignment of animals has reached the farm in good condition. A variety of field crops, including beans, mangels, kohl-rabi, and alfalfa are said to be doing well on the newly broken ground.

The farm is being operated in a thoroughly practical manner, and it is thought that the experiments with live stock and with field crops will be of the greatest interest and importance in connection with the future development of British East Africa.

Goods roads school.—From a recent number of the Breeder's Gazette we learn that: "The Iowa State Highway Commission will conduct the first good roads school of instruction in America at the State college at Ames June 12 to 17. Instruction will be given in the fundamental and essential features of road building and maintenance, with special reference to Iowa conditions. Instruction will be given in the use for road-surveying instruments and in the preparation of road maps and profiles and of plans for road improvement. Particular attention will be given to the proper methods of road drainage of both surface and ground water.

"A special feature of the work will be an extensive exhibit of modern road machinery, with demonstration in its use by men from different places in the State whom the highway commission men have found to be expert in the use of the different road machines. Some short sections of road of different kinds will be built.

"Another special feature of the school will be instruction in the design and building of cement culverts. Detailed standard plans for culverts of different sizes will be furnished by the commission, with full instructions for building them, and to illustrate the work some actual culverts will be built and tested during the school.

"The officers of the Good Roads Association have decided to hold their annual meeting at the college on Thursday and Friday, June 15 and 16, so that those attending can have the benefits of the good roads school."

Miscellaneous.—At the twenty-seventh annual general meeting of the Institute of Chemistry, held on March 1, Dr. David Howard, president, in the course of his address, alluded to the action of the Board of Agriculture of Great Britain in encouraging provincial technical and agricultural colleges to undertake professional chemical work gratuitously, or at purely nominal fees for farmers. Dr. Howard held that this endeavor to help dairy farmers led the colleges, which are maintained at public expense by grants for technical education, to compete with the professional chem-

ists, particularly those retained by the agricultural associations at the expense of the general public. He held that the funds granted to these colleges should be used for promoting the education of farmers in the science and practice of agriculture, instead of being diverted to other purposes.

The Country Calendar is a new monthly publication, resembling in some respects *Country Life in America*. The first number, dated May, 1905, contains twelve or more editorial notes and leading articles by Hon. Grover Cleveland, John Burrows, Secretary James Wilson, Prof. L. H. Bailey, and others. The following departments are each represented by one or more short articles: Garden and orchard, trees and shrubs, stock and poultry, the country house, stable and kennel, the country beautiful, and the automobile. The illustrations are made a special feature of the publication.

The Bohemian Entomological Society has begun the publication of a new journal containing the proceedings of the society and under the title *Časopis České Společnosti Entomologické*. It is edited by a committee of the society, of which F. Klapálek is chairman. The journal is devoted to general entomology, including a description of new species, insect biology, anatomy of insects, and reviews of entomological literature. The articles are written in the Bohemian language, with an occasional résumé in German or French.

According to a note in *The Southern Workman* a gift of $10,000 has been made to the principal of Hampton Institute and a like amount to the principal of the Tuskegee Institute to be used in the improvement of the rural schools for negroes in the South.

Henry H. Goodell, president of the Massachusetts Agricultural College, died aboard the steamship *Nacoochee* April 23 while on his way from Savannah to Boston. An account of his services to agriculture will be given in the next number.

Dr. Albert Benjamin Prescott, director of the chemical laboratory, professor of organic chemistry, and dean of the school of pharmacy of the University of Michigan, died in Ann Arbor February 25, 1905. Doctor Prescott was eminent as a chemical investigator, having contributed frequently to the periodical literature of organic, analytical, and pharmaceutical chemistry and having written several standard textbooks, among which are Quantitative Chemical Analysis, Outlines of Proximate Organic Analysis, and Manual of Organic Analysis. In matters relating to the public health, such as the adulteration of food and the contamination of water supplies, Doctor Prescott was actively interested. Among the many honors bestowed upon him mention may be made of the presidency of the American Chemical Society, American Association for the Advancement of Science, and the American Pharmaceutical Association, and membership in the American Philosophical Society and other prominent organizations.

William Paul, the well-known English rosarian, died March 31, at the age of 83 years. Mr. Paul was the originator of many varieties of roses, and in 1848 published a work entitled "The Rose Garden," which has gone through nine editions.

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EXPERIMENT STATION RECORD.

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Another of the pioneers in agricultural education has passed beyond, following in quick succession his close friends and associates, Stockbridge and Alvord. In length of continuous service in connection with the agricultural colleges few men have equaled and probably none exceeded him, and the history of his life is contained to an unusual degree in the annals of the institution which he served so long and well.

Henry Hill Goodell was identified with the Massachusetts Agricultural College from its very start, being one of the members of the original faculty appointed in 1867. He came to the new institution a young man, less than thirty years of age, who, following his graduation at Amherst College, had seen two years of service in the civil war, and taught for three years thereafter at Williston Seminary, a preparatory school near Amherst. As instructor, professor, and president he labored for thirty-eight years with untiring zeal and enthusiasm for the uplifting and advancement of the college, and for its justification in the eyes of the farmers and the general public.

No man better knew the history of agricultural education or the vicissitudes and dark days through which the older colleges of that class had to pass. He was one of the few pioneers in that field who were not cast aside as the work grew and progressed; but he continued in it up to the time of his death, growing with its growth and rising in position and influence. From first to last he stood for *education* in agriculture as distinguished from superficial training, and his influence was cast for the higher grade of work which he felt the school facilities and conditions of the State warranted. Although his department was not a distinctly agricultural one, he was a strong factor in shaping the course of the institution and in evolving plans for its future development.

He became president of the college in 1886 and remained at its head for nearly nineteen years, administering its affairs with conservatism and judgment. He saw the birth of the new education and its establishment on a more liberal basis in his own and other States; and he

labored for the development of the institution along more advanced pedagogic lines as rapidly as the funds at its disposal would permit.

President Goodell was extremely fond of books and appreciated their value to the student and the investigator. He was the leading spirit in the building up of the college library, devoting a great amount of time to this work and serving voluntarily as librarian for many years. The result was the gathering together of a large and well-selected library, systematically arranged and catalogued, and exceptionally rich in agricultural writings, which will remain a monument to his memory for years to come.

Always keenly alive to the importance of experimentation in agriculture, he imbued his coworkers with the spirit of investigation, and when the Hatch Act was passed he became director of the college station, which he organized. A few years later, when the college and State stations were combined, he retained the directorship, which he held to the time of his death. In this position he stood for a high order of work and a clear, condensed, and lucid presentation in its published form. His duties as director were necessarily quite largely executive, but he gave special attention to the editorial supervision of the publications and to the economical administration of the funds.

With the organization of the agricultural colleges and experiment stations of the country into an association, President Goodell became a conspicuous figure in the national association, and was prominently identified in all the movements supported by it during the first fifteen years of its existence. He was a member of its executive committee from 1888 to 1902, and for the last eight years of that period was chairman. As a member of that committee he had a prominent part in securing the legislation leading to the establishment of agricultural experiment stations in every State and Territory, and the further endowment of the land-grant colleges.

As chairman of the executive committee he devoted much time to the business of the association and to looking after the interests of the institutions represented in it. He was conservative in his action, and his management helped to economize the time of the association and to make its meetings effective. He urged a strict interpretation of the Morrill and Hatch acts, and a careful use of the privileges conferred by them. He pointed out the dangers to the college and station funds of legislation which reduced the income from the sale of public lands; and his committee was instrumental in securing the passage in 1900 of a clause providing that if at any time the proceeds from the sale of public lands should be insufficient to meet the annual appropriations to the colleges and experiment stations, the same should be paid from any funds in the Treasury, thus placing these funds on a sure foundation.

President Goodell was president of the Association of American

Agricultural Colleges and Experiment Stations in 1891, being the third to hold that office. His address before the convention of that year dealt with some of the achievements of agricultural experimentation and the guiding principles underlying it. It led up to an appreciation of the work of the Rothamsted Experiment Station, concluding with the presentation of Dr. R. Warington, who came as the first representative of the English station to deliver a course of lectures under the provisions of the Lawes trust. Two years later, when Sir Henry Gilbert came to this country on a similar mission, President Goodell arranged to have these classic lectures delivered under the auspices of the Massachusetts Agricultural College, the pressure of other business making it impracticable for more than an introduction to them to be delivered at the meeting of the association.

President Goodell had been in poor health for a number of years, being afflicted with a complication of diseases which bore heavily upon him. His indomitable energy, however, led him to hold to his work persistently until ordered away for a rest by his physician. His genial, generous, and lovable nature endeared him to all who came to know him, and his fearlessness in the prosecution of what he believed to be right, his force and ability as an executive, and his sterling qualities of manhood commanded general respect and admiration. In his passing, the Massachusetts Agricultural College is bereft of an able executive, beloved by the students of nearly forty years, and the agricultural colleges and experiment stations throughout the country lose a loyal and enthusiastic friend and supporter.

A distinct step in the direction of encouraging the teaching of agriculture in the high school is the movement to recognize that work in the entrance requirements of higher institutions. To a certain extent these higher institutions determine what must be taught in the high schools leading up to them. Heretofore there has been no inducement to schools that were fitting for the colleges and universities to offer such courses, however much they might desire to do so, and no incentive to a student to take agricultural work if it were offered, since it would not entitle him to credit in meeting the entrance requirements.

This matter has been under consideration in several States, for it has been recognized as a bar to progress in introducing agricultural studies. Definite action has now been taken in Missouri. The university in that State practically determines what shall be taught in the high schools, as students are admitted to it on their accredited high school work. Members of the agricultural faculty have been urging that agricultural work in the schools should be given some recognition, and the council of the university has rec ntly decided to allow a credit of one unit on the entrance requirements for a year's work in

agriculture in a high school. Boys who are planning to pursue the agricultural course in the university can now take elementary work in the high school without endangering their standing for entrance to the university. It is believed that this recognition will stimulate the offering of agricultural subjects in the high schools, and that advantage will be taken of this opportunity by a considerable number of pupils. Several of the schools have shown an interest in agricultural work and desired to introduce it, but have been deterred by the necessity of meeting the requirements in the subjects credited.

A somewhat conditional victory in this direction has also been gained in New York State. There the State regents of education determine what subjects are to be credited in the regents' examinations for entrance to colleges or universities in the State, and agriculture has not been included in the list. Naturally no other subjects would be offered at high schools except as electives, and pupils fitting for college would not be likely to take such elective studies with no chance for credit. This has handicapped the college of agriculture at Cornell in its efforts to extend the teaching of nature study and elementary agriculture in the public schools, and that institution has brought its influence to bear upon the regents of education. At a meeting held last winter the regents decided to allow credits in the regular high school courses for nature study and elementary agriculture, provided the courses in these subjects were so prepared as to show educational values comparable with other subjects now recognized. Since this announcement the faculty of the college of agriculture has been at work on the syllabi of courses in the subjects under consideration, with a view to securing their approval by the board of regents. In that case it is expected that several of the high schools will offer elective courses in agriculture, which will enable them the better to prepare students for the higher agricultural work of the college.

It was the contention at the meeting of the Association of American Agricultural Colleges and Experiment Stations at Des Moines last fall, that the public schools should lead up to the agricultural colleges as they now do to colleges of arts and sciences; and Doctor Jesse explained that in Missouri "we are risking our entire future on the doctrine that the college of agriculture should rest on the public high school, and we are going to make the public high school agricultural so far as it ought to be agricultural." The recognition of agriculture as a teaching subject and as having an educational value will do much to bring about this desired end. It will bring elementary and advanced work in agriculture closer together, and will articulate the agricultural college and the high school as they have not been before.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Gravimetric determination of nitric acid, M. Busch (*Ber. Deut. Chem. Gesell., 38 (1905), No. 3, pp. 861–866*).—The method proposed is based upon the fact that diphenyl-endanilo-dihydrotriazol, for which the author proposes the abbreviated name "nitron," forms insoluble compounds with nitric acid, making it possible to detect this acid in a dilution of 1:60,000 at room temperature and 1:80,000 at 0° C.

The following substances, which also form insoluble compounds with the nitron, and hence may interfere with the determination of nitric acid, are enumerated: Hydrogen bromid in dilutions of less than 1:800, hydrogen iodid in dilutions of less than 1:20,000, nitrous acid in dilutions of less than 1:4,000, chromic acid in dilutions of less than 1:6,000, chloric acid in dilutions of less than 1:4,000, perchloric acid in dilutions of less than 1:50,000, all of which, except chloric and perchloric acids, may be removed with comparative ease.

Among the more rarely occurring substances which may interfere are *Rhodanwasserstoff* in dilutions of less than 1:15,000, ferro- and ferri-cyanid, picric acid, and oxalic acid, the latter, however, not being precipitated in a strong sulphuric-acid solution.

The method recommended is as follows: Dissolve an amount of the substance corresponding to 0.1 gm. of nitric acid in 80 to 100 cc. of water, add 10 drops of dilute sulphuric acid, heat nearly to boiling, and add 10 to 12 cc. of the nitron acetate solution (10 per cent solution of nitron in 5 per cent acetic acid); allow the flask to stand for 1½ to 2 hours in ice water and collect the precipitate on a Neubauer crucible; run the filtrate through the crucible again, and when the solution has been completely removed wash with 10 to 12 cc. of ice water, the wash water being added in small portions and each portion completely removed before another is added; dry the precipitate at 110° to constant weight, which can be done in ¾ hour.

In calculating the results the formula $C_{20} H_{16} N_4 . HNO_3$ is used, the amount of nitric acid present being estimated by multiplying the weight of the nitron nitrate by $\frac{63}{375}$.

A series of tests of the method on pure potassium nitrate are reported which show a close agreement between the determined and calculated amounts of nitric acid. When nitrites are present they interfere with the accuracy of the determination and must be removed. This is done by dissolving the substance in a small amount of water (0.2 gm. in 5 to 6 cc. of water) and allowing the solution to drop slowly on finely pulverized hydrazin sulphate (about ¼ gm.), which decomposes the nitrites, allowing the nitrogen to escape in the free state.

The electrolytic oxidation of ammonia to nitrite, E. Müller and F. Spitzer (*Ber. Deut. Chem. Gesell., 38 (1905), No. 3, pp. 778–782*).—This article describes apparatus and methods used and gives results obtained in electrolytically oxidizing ammonia to nitrite in sodium hydroxid solution. The method used is based on the work of Traube and Biltz.

Studies on the action of different physical and chemical agents on the gluten of wheat flour, E. Fleurent (*Ann. Sci. Agron., 2. ser., 9 (1904), II, No. 3, pp. 450–472*).—On the basis of investigations extending over many years the author

discusses the gluten of wheat flour and its determination. In his opinion gluten is a definite constituent of flour and its mechanical extraction may be accomplished without loss under suitable conditions. If water of 16° C. temperature is used containing 80 to 90 mg. or 0.8 or 0.9 per cent of the total lime in the form of bicarbonate, and extraction is continued for 10 or 11 minutes and washing for 2 or 3 minutes, and the gluten is dried at 105°, results will be obtained which agree to 0.2 of a per cent, differences which are not greater than noted with other methods of chemical analysis.

On the rational determination of gluten in wheat flour, E. FLEURENT (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 2, pp. 99–101*).—A method of determining gluten in flour is given.

The estimation of the adhesiveness of starch, O. SAARE and P. MARTENS (*Ztschr. Spiritusind., 26 (1903), pp. 436, 437; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 4, p. 224*).—A method of estimating the adhesiveness of starch is proposed, which depends upon measuring the resistance offered when a body is allowed to drop into hot starch paste and is removed after the paste has been allowed to cool and harden.

Concerning the invertin of yeast, B. HAFNER (*Ztschr. Physiol. Chem., 42 (1904), No. 1–2, pp. 1–34, pl. 1*).—Analytical and other data are reported and discussed.

The determination and estimation of small quantities of maltose in the presence of dextrose, J. L. BAKER and W. D. DICK (*Analyst, 30 (1905), No. 348, pp. 79–85*).—In investigating the products of the acid hydrolysis of starch the authors find that small quantities of maltose in a mixture of maltose and dextrose freed from dextrinous bodies of high molecular weight by repeated precipitations in alcohol, or mixtures of alcohol and acetone, may be estimated with a fair degree of accuracy by determining the reducing power before and after inversion under standard conditions. In a solution of the mixed sugars fermented with *Saccharomyces marxianus* a rise in the specific rotary power and a fall in the reducing power is considered additional evidence of the presence of maltose. To place the matter, however, beyond doubt the solution, after fermentation, may be converted into maltosazone, which may be identified by its microscopical appearance and melting point.

The inversion of cane sugar in the presence of milk constituents, F. WATTS and H. A. TEMPANY (*Analyst, 30 (1905), No. 349, pp. 119–123*).—The method of Stokes and Bodmer was found to give appreciably too low results on condensed milk, the difficulty, however, being avoided by increasing the time of boiling from 10 minutes to 40 minutes.

The determination of ammonia in milk, W. N. BERG and H. C. SHERMAN (*Jour. Amer. Chem. Soc., 27 (1905), No. 2, pp. 124–136*).—High results were invariably obtained when the milk was made alkaline and boiled under atmospheric pressure to expel the ammonia. "The Boussingault-Shaffer method in which the sample is mixed with methyl alcohol, made alkaline with sodium carbonate and distilled under diminished pressure, has been slightly modified and found to be sufficiently delicate for the determination of ammonia in milk where the amount is often less than 0.001 per cent." Under certain conditions the sodium carbonate caused a cleavage of ammonia from organic matter which could be largely if not entirely prevented by saturating the boiling mixture with sodium chlorid. "Preliminary experiments indicate that while milk ordinarily tends to develop both acidity and ammonia on standing, there is no necessary connection between the two, since either may increase rapidly while the other increases slowly, if at all."

On the detection of water containing nitrates in milk by means of formalin and sulphuric acid, EICHLOFF and H. PFLUGRADT (*Milchw. Zentbl., 1 (1905), No. 2, pp. 68–71*).—In the presence of nitrates and formalin in milk the addition of sulphuric acid produces a blue ring between the layers, which reaction, however, may

easily be confused with the coloration produced in heated milk free from nitrates. No characteristic reaction was obtained when less than 18 per cent of water containing 8 mg. of N_2O_5 per liter had been added to the milk. The reaction was positive in the greater number of samples examined in which the presence of water was indicated by the composition of the milk. Owing to the failure of this test, when water free from nitrates has been added to the milk and the difficulty of distinguishing the reaction from that produced in pasteurized milk, the test is not recommended for practical purposes, but is considered of value to the chemist in confirming conclusions drawn from the composition of milk.

Refractometer investigations of milk and meat, RIEVEL (*Deut. Tierärztl. Wchnschr., 13 (1905), No. 12, pp. 133–137, figs. 3*).—Investigations by means of the Zeiss immersion refractometer were made of the milk of normal and diseased women and cows; milk preserved with formalin, boric acid, borax, sodium salicylate, and potassium bichromate; and of the flesh of normal and diseased cattle, pigs, sheep, dogs, rabbits, guinea pigs, poultry, and horses. The method is believed to be of no practical value as a means of detecting preservatives or determining whether milk or meat came from healthy or diseased animals.

On the cryoscopy of milk, A. DESMOULIÈRE (*Ann. Chim. Analyt., 10 (1905), No. 3, pp. 89, 90*).—It is shown that sodium bicarbonate, formalin, and glycerin materially affect the freezing point of milk. A sample of milk showing a freezing point of −0.53° C. showed the same determination after the addition of 50 cc. of water and 1 gm. of glycerin. Inasmuch as the freezing point is not affected by the removal of fat and is influenced by other means, it is believed that this method can be used only in connection with chemical analysis as a means of determining adulteration of milk.

Cryoscopy of milk, I. S. BOMSTEIN (*Russ. Vrach., 3 (1905), No. 3; abs. in Jour. Amer. Med. Assoc., 44 (1905), No. 15, p. 1236*).—The value of cryoscopy as a means of detecting the addition of water to milk is confirmed by the author, who claims that even 5 per cent of water can be infallibly detected by this means.

Experience with "sin-acid" butyrometry, H. HÖFT (*Molk. Ztg., 19 (1905), No. 13, pp. 309, 310*).—Following directions for the use of this test, the author has obtained satisfactory results as compared with the Gerber method. The Gerber test bottles gave equally as good results as those especially devised for the purpose.

Experiments on the usefulness of the Sichler "sin-acid" butyrometry, LOTTERHOS (*Molk. Ztg., 19 (1905), No. 7, pp. 145, 146*).—Comparative tests of the Sichler and Gerber methods are reported. The nonacid method is believed to be well suited for the rapid determination of fat in whole milk, skim milk, buttermilk, acid and preserved milk. The fat layer was clearly differentiated without the use of the centrifuge. The results by the 2 methods agreed closely.

"Sin-acid" butyrometry, M. POPP (*Molk. Ztg., 19 (1905), No. 9, pp. 197, 198*).—This is supplementary to a previous article by the author (E. S. R., 16, p. 640) and consists essentially of a discussion of this method. It is believed that this method must not be considered as a new one, but merely as a new form of the long discarded alkali method.

Practical notes on the analysis of butter, VUAFLART (*Abs. in Ann. Chim. Analyt., 10 (1905), No. 3, pp. 118, 119*).—Methods employed by the author in the analysis of butter and the average results obtained on 35 samples are reported.

A simple method for the determination of fat in butter, A. HESSE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, pp. 673–675*).—A modification of the Gottlieb method is described.

Note on the detection of cocoanut oil in adulterated butter by the method of Müntz and Coudon, F. JEAN (*Ann. Chim. Analyt., 10 (1905), No. 3, pp. 96–98; Indus. Lait [Paris], 30 (1905), No. 15, pp. 173–175*).—The method of Müntz and

Coudon (E. S. R., 15, p. 850) depending upon the relation of the water-soluble and insoluble volatile fatty acids was applied by the author to mixtures of known composition and to 11 commercial samples with satisfactory results.

On the specific rotation of salts of casein, J. H. Long (*Jour. Amer. Chem. Soc., 27 (1905), No. 4, pp. 363–366*).—Casein was prepared from diluted separator skim milk by precipitation with acetic acid, repeated washing by decantation with distilled water, and dissolving in weak sodium hydroxid. After repeating this process several times the precipitate was washed with alcohol and ether and the residue dried over sulphuric acid. Determinations at 20° were made of the specific rotation of sodium, potassium, lithium, and ammonium compounds of casein. The values obtained were higher than those previously reported. In all cases the specific rotation was increased with increase of alkali.

Chemical studies of Tunis olive oil, E. Milliau (*Seifensieder Ztg., 31 (1904), pp. 77, 78, 98, 99, 118, 119, 135, 159, 183; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 9, pp. 586, 587*).—The composition of Tunis olive oil and related questions are the subjects taken up by the author.

Quantitative determination of pentosans and methyl pentosans in natural products, W. B. Ellett (*Inaug. Diss., Univ. Göttingen, 1904, pp. 50; abs. in Jour. Landw., 53 (1905), No. 1, pp. 13–25*).—The purpose of the investigations reported was to devise a method for the simultaneous determination of methyl pentosans and pentosans in vegetable products. Votoček's statement was confirmed that methyl-furfurol-phloro-glucid in distinction from furfurol-phloro-glucid, even when dried, is soluble in alcohol. It seemed probable, therefore, that the methyl-furfurol-phloro-glucid and the furfurol-phloro-glucid could be weighed together; the methyl-furfurol-phloro-glucid removed with alcohol; and the furfurol-phloro-glucid remaining weighed, the difference between the two weighings, of course, giving the quantity of methyl-furfurol-phloro-glucid. Details of the method outlined were elaborated and a number of tests showed that it was satisfactory. Formulas were devised designed to simplify the method of calculation, and a table which showed the amount of methyl pentose, i. e., rhamnose, corresponding to 0.010 gm. to 0.149 gm. of phloro-glucid. The author states that rhamnose is the only methyl pentose with which he was able to experiment, but that possibly other pentoses would differ in the amount of methyl-furfurol which they would produce.

In addition to the above, studies were made of the methyl pentosans or methyl pentoses obtained by hydrolysis of pomegranate and white pepper. From green pomegranate rhamnose was isolated, which explains the formation of methyl furfurol by distillation of pomegranate. In the case of white pepper the author did not succeed in isolating the mother substance of furfurol and methyl furfurol. Studies with tetrose were undertaken to find a typical reaction for this group.

On the distribution of potassium in animal and vegetable cells, A. B. Macallum (*Jour. Physiol., 32 (1905), No. 2, pp. 95–128, pls. 2*).—Specially prepared hexanitrite of cobalt and sodium was used in the experiments reported as a precipitant for potassium. When the reagent is prepared by dissolving 20 gm. cobalt nitrite and 35 gm. sodium nitrite in 75 cc. of water, adding thereto 10 cc. of glacial acetic acid and diluting with water to 100 cc., it precipitates instantaneously and completely, according to the author, all the potassium from its solutions as the triple salt. After treating cellular elements and fresh tissues with the reagent they must be thoroughly washed with ice-cold water to remove all traces of the precipitant. The triple salt will be left behind and if abundant may be detected under the microscope by its light yellow color. The presence and distribution of minute quantities may be detected by treating with ammonium-sulphid solution which gives a black coloration due to cobaltous sulphid reaction wherever triple salt is precipitated. Some of the author's conclusions follow:

"As revealed by the method potassium occurs in both the cytoplasm and the extracellular structures. In the latter it is present as a product of impregnation and infiltration and, as a consequence, there are few such structures that are free from it. In intercellular material and in inert or dead matter it is usually very abundant. The cell nucleus does not normally contain the slightest trace of potassium. . . . Nerve cells are wholly free from potassium and this freedom extends to the dendrites and axons. . . .

"The potassium obtaining in cytoplasm occurs in two conditions, that of physiological precipitation, and that of physiological or biochemical condensation.

"The precipitation is not of a physical character, but may perhaps be of the nature of fixation, in an inert form, of the potassium in passive colloidal material in the cytoplasm. This precipitation is the process, apparently, by which living, active cells dispose of the excess of potassium salts which may invade them, as in the case of vegetable forms, in very great excess. . . .

"In smooth muscle fiber the potassium found is scant and it is diffused throughout its cytoplasm, but in striated fiber there is a condensation of the potassium in the dim bands, the rest of the fiber being free from the element. When the fiber is in the contracted condition the potassium is most abundant in the middle third of the band, at least such is the case in the wing muscles of the scavenger beetle. It is the doubly-refractive substance of the dim bands that, apparently, constitutes the contractile material, that is the inogen of Hermann, and its association with potassium suggests some relation of the latter, not with contraction, for smooth muscle fiber shows that property, nor with tetanus, for in cardiac muscle the potassium is disposed as in ordinary striated fiber, but with rapidity of contraction, which distinguishes striated fiber from smooth.

"There is in the secreting cells of the pancreas of the guinea pig and rabbit a remarkable concentration of potassium compounds in that portion of the granular zone immediately adjacent to the lumen, while the remainder of the cytoplasm is free from them.

"There are organisms which manifest a distinct capacity to absorb potassium and amongst them is one, parasitic on Spirogyra, whose mycelial threads exhibit kaliophilism in a special degree."

It was found that the cobalt reagent used gave a precipitate with creatin, but not with a number of amid acids, acid amids, and other substances tested.

Exercises in practical physiological chemistry, S. W. Cole (*Cambridge: W. Heffer & Sons; London: Simpkin, Marshall & Co., 1904, pp. 152; rev. in Lancet* [*London*], *1905, I, No. 14, p. 936*).—A text-book designed for laboratory use.

Preliminary communication on the methods of analysis adopted at the Twentieth Convention of the Agricultural Experiment Stations in the German Empire, H. Neubauer and V. Schenke (*Landw. Vers. Stat., 61* (*1905*), *No. 5–6, pp. 351–356*).—A brief summary of the proceedings of this convention.

Miscellaneous analyses, G. E. Colby (*California Sta. Rpt. 1904, p. 48*).—Brief notes are given on the results of examinations of oranges, dried prunes, dried figs, olive oil, pickled olives, olive soap, vinegar, salt, "niter earth," sulphur, etc.

Methods of chemical analysis as applied to sewage and sewage effluents, G. McGowan, R. B. Floris, and R. S. Finlow (*Roy. Com. Sewage Disposal* [*Great Britain*] *Rpt., 4* (*1904*), *pt. 5, pp. 70, figs. 7*).—Descriptions are given of methods of sampling; preliminary observations on color, smell, reaction, matter in suspension, the presence of unusual substances, etc., are described; and methods of determining free and saline ammonia, albuminoid ammonia, nitric and nitrous nitrogen, organic and total nitrogen, oxygen absorbed, combined nitrogen, total, suspended, and soluble solids, cellulose, dissolved gases, etc., are explained in detail.

BOTANY.

A college text-book of botany, G. F. Atkinson (*New York: Henry Holt & Co., 1905, pp. XVI+737, figs. 592*).—This new text-book is a revision and elaboration of the author's Elementary Botany (E. S. R., 10, p. 611). The method of treatment is topical, the book being divided into 5 parts, physiology, morphology and life history of representative plants, plant members in relation to environment, vegetation in relation to environment, and representative families of angiosperms.

Parts of the book have needed but little rewriting, while other chapters are thoroughly revised and are brought up to date. This is true particularly of those parts which treat of the nutrition of plants, the morphology of fertilization in the gymnosperms and angiosperms, the chapters on algæ and fungi, as well as the general scheme of classification, but the part treating of ecology has been rewritten and considerably extended in harmony with recent investigations.

The work is well illustrated, many of the figures being new and especially prepared with reference to the text.

Farm grasses of the United States, W. J. Spillman (*New York: Orange Judd Co., 1905, pp. XV+248, figs. 54*).—In preparing this volume the author has undertaken to present, in connected form, the main facts of interest to the farmer concerning the grasses grown in this country. Wherever the information was available, the actual practices in grass growing are fully described, the treatment as far as possible being from the standpoint of the farmer. The country, it is said, may be divided into 4 regions, based on the character of grasses grown, and the especial problems of each are described. Chapters are devoted to the subjects of meadows and pastures and grass seed, and particular attention is given to timothy, bluegrasses, millets, redtop and orchard grass, Brome grass, grasses of minor importance, lawns and lawn making, and grasses for special conditions.

On the whole, the book appears to be a practical treatise on the grass crop, seeding and management of meadows and pastures, description of the best varieties, grass seed and its impurities, and grasses for special conditions.

Report of the botanist, J. J. Thornber (*Arizona Sta. Rpt. 1904, pp. 489–493*).—A report is given on the conditions on the range, studies on forage problems, seed germination, etc. In connection with the range investigations, 20 species of forage plants were sown, and of these *Andropogon leucopogon*, *Bouteloua rothrockii*, and *Panicum texanum* have merited favorable consideration. The relative value of some of the other species is commented upon.

In connection with the forage plant problems the native species have in nearly every instance proved superior to introduced ones when tested with a limited amount of irrigation. Notes are given on the use of singed cactus as forage, and attention is called to some investigations on seed germination. It is shown that a number of species, such as acacias, mesquites, palo verde, and others which are very resistant to moisture, can be germinated immediately if treated for 2 to 6 minutes with water heated to 85–88° C. Similar results were obtained by scratching or cutting the seed coat or in any way rendering it more permeable to water. In connection with the germination experiments it was found that the seed of acacia, mesquite, honey locust, locust, and Kentucky coffee tree were made to germinate readily when immersed for a short time in concentrated sulphuric acid in which chromic acid had been dissolved, and then neutralized in a dilute solution of potassium hydrate. The seed should be washed in running water for several hours previous to planting.

Miscellaneous notes are added in which it is shown that about 2,000 eucalyptus trees were distributed during the past year to determine the practicability of planting eucalyptus in southern Arizona, and the failure of English walnuts to grow in the vicinity of Tucson is commented upon.

The tomato blight, a bacterial disease due to *Bacillus solanacearum*, is reported as

having been very destructive in southern Arizona. Preliminary spraying experiments with Bordeaux mixture were begun to test the possibility of controlling this disease and will be continued the ensuing year.

Report of the division of economic botany, H. M. HALL (*California Sta. Rpt. 1904, pp. 76-83*).—A report is given by the assistant botanist on the investigations in economic botany carried on between July, 1903, and June, 1904. During this time a large number of plants were determined for different correspondents and opinions given relative to their economic value. At the same time studies were continued on weeds and poisonous plants.

Botanical studies are being made of ornamental and economic plants, and it is hoped to have all such represented in the economic herbarium. The additions to the general herbarium are shown, and brief reports given on the plants received for identification.

An experiment on the relation of soil physics to plant growth, B. E. LIVINGSTON and G. H. JENSEN (*Bot. Gaz., 38 (1904), No. 1, pp. 67-71, figs. 3*).—In a previous report (E. S. R., 15, p. 751) one of the authors expressed the opinion that the nature of vegetation covering any upland area would be determined by the amount of water present in the surface layers of the soil. To test this hypothesis cultures were made in which crushed quartz of 3 grades was placed in open-headed barrels and various nutrient salts were added. Plants of the same species and frequently from the same clumps were transplanted to the barrels after they had been sunken level with the surface of the ground. The only difference between the 3 cultures is said to have been that of the different grades of sand, which was crushed quartz of almost pure silica.

The 3 cultures were exposed to the same external conditions of precipitation, moisture, soil, etc., and were started at the same time. For a few days no difference could be noticed in the growth of the plants, but gradually those in the finest sand gained the ascendancy in the rate of growth. The figures presented were made from photographs taken a month and a half after the beginning of the experiment and show decided differences in the rate of growth.

A table is given showing the height of the different plants in the 3 cultures, and while the figures presented are quite significant, they are said to not fully express the inequality of the characters of the plants.

It is held that this experiment offers somewhat conclusive evidence in favor of the above-mentioned hypothesis.

The effect of salt water on plants, R. OTTO (*Ztschr. Pflanzenkrank., 14 (1904), No. 3, pp. 136-140*).—An account is given of injury to various plants by watering them with the waste water from a stream which carried considerable salt in solution. The reservoir from whence the water was taken was filled from a stream that flowed near a coal mine, and during the process of mining a salt spring was developed which flowed into the reservoir. The concentration of the salt solution became so great after a time as to seriously injure all plants, the injury being first indicated by the appearance of red spots on the foliage, ultimately followed by the death of the plants..

Analyses of dead plants and soils from pots in which they were grown showed the presence in the air-dried soil of 0.193 per cent of sodium chlorid. The ash of the plants was also determined, and while sound plants had 25.92 per cent ash, the ash of specimens killed by the saline water was 41.74 per cent of dry substance.

The salt water limits of wild rice, C. S. SCOFIELD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 72, pt. 2, pp. 8*).—The author records the results of an inquiry into the degree of salinity which wild rice will withstand. This information was sought to determine the practicability of planting wild rice in various localities. The method of testing the salt content of the water was that used by the Bureau of Soils for testing strengths of solution.

The investigation was carried on along the Potomac River at a number of localities, and from the survey made it is assumed that the salt water limit of wild rice is approximately that represented by 0.03 of the normal solution of sodium chlorid. This is considerably less than the concentration of the water of Chesapeake Bay and probably indicates the maximum salt water resistance of the species in the regions examined. Where less strengths of solution than this were observed the growth of wild rice took place about in proportion to the strength of solution. It is also stated that the salt water limits of wild rice may be approximately determined by the simple test of taste. When water is appreciably salt to the taste it is too salt for the successful growth of this plant.

The assimilation of certain organic substances by chlorophyll-bearing plants, P. Mazé and A. Perrier (*Ann. Inst. Pasteur, 18 (1904), No. 12, pp. 721–747, pls. 2, figs. 11*).—The authors report a preliminary series of experiments with maize in which the assimilation of some organic substances was studied. The effect of the different substances on the germination was investigated, as well as on the development of the plants after having been germinated.

Sugar, glycerin, methyl alcohol, and ethyl alcohol were found to retard the germination of maize for several days without wholly preventing the development of the plants. When added to solutions in which the plants are already growing sugars are assimilated in darkness, but they are not able to supply the action of the sun in photosynthesis. When added to culture media they are rapidly assimilated in sunlight, and from the results of some of their experiments the authors conclude that soluble organic substances in soils or solutions may aid in the growth of the chlorophyll-bearing plants. Where the plants were more advanced in growth glycerin was absorbed in sunlight, but the growth of the plants was checked. Ethyl alcohol proved somewhat injurious, which is believed to be due to the formation of aldehyde. Methyl alcohol was readily taken up and it is believed was assimilated by the plants. The toleration of chlorophyll-bearing plants to the alcohols was exceedingly variable. Some species seemed resistant to large quantities, but these compounds did not add to the starch content of the plant while in the dark nor protect the starch already occurring in the leucoplasts.

The addition of dextrose to the mineral solutions induced chlorosis in the plants growing in them, and it is believed that this class of compounds may play an important part in the occurrence of that disease. The authors experimented with plants grown without iron, and attribute the chlorosis not so much to the absence of the iron but to a superabundance of the alkaline bases, which render the iron less available or retard its action altogether.

The action of sodium nitro-prussid on plants, R. Bahadur (*Bul. Col. Agr. Tokyo Imp. Univ., 6 (1904), No. 2, pp. 177–179*).—The highly poisonous character of nitro-prussid of sodium for animals has been demonstrated, and the author briefly reports some experiments with various algæ, fungi, and other plants to determine whether it possessed the same poisonous property toward plants as toward animals. It was found to be a comparatively weak poison for the lower animal organisms and green plants, so long as daylight was excluded, and not to be poisonous to fungi at all. The effect of daylight is to decompose the salt with the production of prussic and nitrous acids.

The effect of sulphurous acid, zinc oxid, and zinc sulphate on plants, E. Haselhoff and F. Gössel (*Ztschr. Pflanzenkrank., 14 (1904), No. 4, pp. 193–201, pls. 2*).—A report is given of pot experiments with wheat to test the effect of sulphurous acid, zinc oxid, and zinc sulphate on the plants and soil. The soil used in the experiments was a light sandy loam and fairly well supplied with the nutritive materials required by the plants but rather deficient in lime. On this account 10 gm. of calcium carbonate was added to each pot in some of the series. Sulphurous acid was passed into the soil and later the pots were all seeded to wheat.

The wheat was allowed to mature, after which the soils, grain, and straw were analyzed. It was found that the sulphuric-acid content of the soils was increased, doubtless due to the oxidation of the sulphurous acid. The growth of the plants was not interfered with where there were present in the soil bases, such as lime or magnesia, with which the sulphurous acid could combine. The sulphuric acid content of the cereal, especially that of the straw, increased in proportion to the sulphuric-acid content of the soil.

The experiments with the zinc compounds were carried on in a similar manner to those described above. It was found that the addition of as much as 0.235 per cent of zinc oxid was without effect on the plants. The lime content of the soil was found to exert no influence on the action of the zinc oxid, and there was no increase noticed in the zinc content of the plants.

Where zinc sulphate was added to the soils it proved highly injurious to the wheat plants and the injury was not reduced to any extent by the application of large amounts of lime.

Injury to vegetation by smelter fumes, J. K. Haywood (*U. S. Dept. Agr., Bureau of Chemistry Bul. 89, pp. 23, pls. 6, fig. 1*).—The results are given of investigations made to ascertain the extent of injury inflicted on surrounding vegetation by a copper smelting plant located near Redding, Cal. After describing the general character of the region, the location of the smelter, and the appearance of the vegetation the author discusses the chemical principles underlying the investigation.

The ore used by the smelting company consists largely of sulphids of iron and copper, and the impurities are either fluxed or burned off. This results in the production of a large amount of sulphur dioxid and to some extent sulphur trioxid.

Experiments were conducted to test the visible injury by sulphur dioxid, in which potted plants were subjected for various lengths of time to different proportions of sulphur dioxid in the atmosphere. The effect of this treatment on the foliage and the results of analyses of the leaves are given, after which the analyses of foliage collected about the smelter are given and comparisons drawn between the two series of analyses.

The author also summarizes the results of a number of other investigations on the injury to vegetation by smelter fumes, and from his investigations draws the following conclusions:

"Sulphur dioxid when present in very small quantities in the air kills vegetation. Such injury shows itself by the increased sulphur trioxid content of the foliage. The vegetation around the smelter for at least 3½ miles north, 9 miles south, 2½ miles east, and 5 to 6 miles west has been greatly injured. The water of the Sacramento River is polluted by the waste material from the smelter. It is the opinion of the author that this injury to vegetation will continue and even increase its limits unless the fumes are condensed. The fumes can be condensed and sulphuric acid formed, for which a ready market would probably be found."

The absorption of electromagnetic waves by living vegetable organisms, G. O. Squier (*San Francisco, 1904, pp. 32, pls. 4, figs. 3*).—In connection with a report on investigations of wireless telegraphy carried on for the War Department, the author gives an account of some phenomena suggested by the action of trees as conductors for electromagnetic oscillations. The experiments were carried on principally in the vicinity of San Francisco, a grove of eucalyptus trees being utilized as the receiving station.

The apparatus and method of experiment are described, and it is said that the trees were found to serve as a substitute for the towers and masts usually required to carry the antennæ wires. The investigations showed that the trees were capable of receiving and giving off the electric current required in wireless telegraphy, and marked differences in efficiency were noted with different species of trees, such as willow, pine, spruce, oak, etc. A tree with a small leaf surface and in an unhealthy con-

dition was found to be poorly suited for the purpose of the experiment, and dead trees practically behaved as insulators.

After a little practice it was found that two men could install a sending station in from 10 to 15 minutes, or a receiving station in even less time. All that was necessary was to fasten the apparatus to the side of the tree and attach the wires, one above and one below, nailing them into the tree.

In the course of the experiments an attempt was made to measure the electrical resistance of plant cells between the metallic electrodes inserted in the trunk of a tree, and several curves were taken, but sufficient regularity was not observed to enable any generalization regarding the phenomena. In summing up his investigations the author believes that living plants may serve a more important part in electrical phenomena than has been generally supposed, and he urges a more general study of the physical phenomena as related to plants.

Beneficial bacteria for leguminous crops, G. T. Moore and T. R. Robinson (*U. S. Dept. Agr., Farmers' Bul. 214, pp. 48, figs. 17*).—This is a popular bulletin giving the results of investigations of the authors on the subject of nitrogen assimilation by leguminous crops and the use of artificial inoculating material for the production of root tubercles upon this class of plants. A previous publication giving in detail the information upon which this bulletin is founded has been noted (E. S. R., 16, p. 850).

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev., 32 (1904), No. 12, pp. 547–592, figs. 2, charts 15*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the month of December, 1904, recent papers bearing on meteorology, etc., this number contains the following articles and notes:

Special contributions on Recent Additions to the Weather Bureau Library, by H. H. Kimball; The New "Meteorologia" by A. I. Woeikof, by S. Hanzlik; The Results of the Work Done at the Aeronautical Observatory at Tegel, near Berlin, from October 1, 1901, to December 31, 1902, by S. Hanzlik; Evaporation Observations in the United States (illus.), by H. H. Kimball (see p. 956); Perpendicular Cold Air Movements as Related to Cloud Velocity, by W. A. Eddy; A Cloud Phenomenon at Omaha, Nebr., by W. F. Riggs; The Introduction of Meteorology into the Courses of Instruction in Mathematics and Physics, by C. Abbe; The Storm and Cold Wave of December 24 to 29, 1904, by W. J. Bennett; and Some Relations Between Direction and Velocity of Movements and Pressure at the Center of Ellipsoidal Cyclones (illus.), by S. Hanzlik; and notes on William Norrington, nitrogen in rain water, the vapor pressure of mercury, Weather Bureau men as instructors, kite work by the Blue Hill Observatory and the United States Weather Bureau, and storm on the Pacific Coast, December 27–31, 1904.

Meteorological observations, A. O. Leuschner et al. (*California Sta. Rpt. 1904, pp. 132, 133, 197, 209, fig. 1*).—A summary of observations at Students' Observatory at Berkeley on temperature during the period from September, 1902, to June, 1904, is given, with a record of observations at the same place during the year ended June 30, 1904, on pressure, temperature, precipitation, relative humidity, cloudiness, and direction of the wind. Observations at the Santa Monica and Chico forestry substations for the same period are also reported.

Meteorological observations, W. A. Stocking, Jr. (*Connecticut Storrs Sta. Rpt. 1904, pp. 241–248*).—This is a record of observations on temperature, pressure, humidity, precipitation, and cloudiness during each month of 1903 at Storrs; rainfall during the six months ended October 31, 1903, at 22 places in Connecticut; monthly mean temperature and monthly precipitation for 15 years (1888–1902); and dates of

last and first killing frosts for 15 years. The mean temperature for the year at Storrs was 46.8°; total precipitation, 48.45 in.; number of cloudy days, 120. The average rainfall for the State during the 6 months ended October 31 was 25.78 in. The mean annual temperature for 15 years has been 47°, the annual precipitation 47.36 in.: the average length of growing season 146 days.

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1904, No. 2, pp. 18, chart 1*).—This is a summary of observations on high winds in the lake region during the season of navigation, 1904; wind velocities and anemometer exposures; precipitation in the lake region, November, 1903, to October, 1904; lake levels, 1904; opening and closing of navigation, 1904; vessel passages at Detroit, Mich., during the season of navigation, and wrecks and casualties during 1904.

Daily variations of temperature in the upper air, L. Teisserenc de Bort (*Compt. Rend. Acad. Sci.* [*Paris*], *140* (*1905*), *No. 7, pp. 467–470, fig. 1*).—Observations by means of balloons during 3 years at heights varying from 2 to 10 kilometers are summarized and discussed, vertical isotherms being traced for some of the periods of observation.

Rainfall returns (*Agr. News* [*Barbados*], *4* (*1905*), *No. 77, p. 86*).—The monthly rainfall during 1904 in Antigua (mean of 70 stations) and at the botanic gardens in Santa Lucia is summarized.

Rainfall in the agricultural districts, E. L. Fowles (*Queensland Agr. Jour.*, *15* (*1905*), *No. 6, p. 798*).—A table is given which shows the total rainfall for each month of 1904 in 41 agricultural districts of Queensland.

Autumn rainfall and yield of wheat, W. N. Shaw (*Jour. Soc. Arts*, *53* (*1905*), *No. 2727, pp. 366, 367; Nature* [*London*], *71* (*1905*), *No. 1846, pp. 470, 471, fig. 1*).—A table is given which shows the relationship between the rainfall during 13 weeks, covering approximately the months of September, October, and November, and the succeeding yield of wheat in England for 21 years, 1884 to 1905. The figures show in general that "the yield of wheat goes up as the autumn rainfall goes down, and vice versa. . . .

"With certain exceptions, every inch of autumn rainfall involves a diminution of the yield of wheat for the following year by a bushel and a quarter per acre. It may be premised that the extreme variation of yield was from 26 bu. in 1892, 1893, and 1895 to 35 bu. in 1898. If the yield be computed from the autumn rainfall by subtracting from the datum of 39.5 bu. per acre a bushel and a quarter for every inch of autumn rainfall, the 'computed yield' obtained in this way shows an astonishing agreement with the actual yield given in the official returns. . . .

"Various reasons may be given for regarding the autumn rainfall as likely to influence the yield of wheat; the washing of nitrates from the soil by the rain or the postponement of sowing to the spring on account of the wet are, no doubt, effective, but that all causes should combine to make the dryness of autumn the dominant factor in determining the yield, as it clearly is, is very remarkable."

Cannon defense against hail (*U. S. Dept. Com. and Labor, Mo. Consular Rpts.*, *1905, No. 292, pp. 64–66*).—This is a brief note on a report on the use of hail cannon during the last year by J. Chatillon, president of two local agricultural societies and of the Hail Cannon Society of Limas.

The pagoscope, G. Vitoux (*Nature* [*Paris*], *33* (*1905*), *No. 1654, p. 151, fig. 1; abs. in Lit. Digest*, *30* (*1905*), *No. 13, p. 470, fig. 1*).—A device carrying both a wet-bulb and a dry-bulb thermometer with a double scale and pointer so arranged that the usual mathematical calculations are obviated and the probabilities of frost during the night are readily determined from the readings of the two thermometers shortly before sunset.

WATER—SOILS.

Evaporation observations in the United States, H. H. KIMBALL (*Mo. Weather Rev., 32 (1904), No. 12, pp. 556–559, fig. 1*).—This paper, which was read before the Twelfth National Irrigation Congress at El Paso, Tex., November 16–18, 1904, summarizes observations in the United States, especially those of D. Fitzgerald[a] at Boston, Mass., L. G. Carpenter at the agricultural experiment station at Fort Collins, Colo., T. Russell at various signal service stations, E. Stelling at St. Petersburg, and by the United States Weather Bureau in different parts of the United States, particularly in cooperation with the United States Geological Survey. The formulas of Fitzgerald, Russell, and Carpenter for computing evaporation are discussed.

"The equations of Fitzgerald and Carpenter appear to have a quite general application, provided we know the temperature of the water surface, the dew-point, and the wind velocity. It would seem, therefore, that in the absence of reliable measurements of evaporation from water surfaces, an effort should be made to determine the temperature of water surfaces near Weather Bureau stations, and where the evaporation is measured from tanks sunk in the ground the relation between the temperature of this evaporation surface and the temperature of lakes or reservoirs in the vicinity should be carefully determined.

"Seasonal evaporation naturally varies with geographical position. Some of its peculiarities are shown in the following table:"

Evaporation in inches.

Month.	Boston, Mass.	Fort Collins, Colo.	Clear Lake, Cal.	Fort Bliss, Tex.
January	0.90	1.50	0.85	2.35
February	1.20	2.00	.60	2.45
March	1.80	3.50	2.00	6.25
April	3.10	5.00	2.82	7.35
May	4.61	6.50	3.85	10.85
June	5.86	8.00	4.30	11.20
July	6.28	9.50	5.90	9.60
August	5.49	8.50	4.70	9.50
September	4.09	6.50	3.72	9.20
October	2.95	4.50	2.12	6.80
November	1.63	2.50	.65	4.15
December	1.20	1.50	.55	2.95
Year	39.11	59.50	32.38	82.65

"The above table indicates the importance to irrigation engineers of making the readings throughout the entire year."

Analyses of waters, G. E. COLBY (*California Sta. Rpt. 1904, pp. 34–43*).—This article reports and discusses the results of analyses of 144 samples of water from different sources in the State.

Soil investigations, H. SNYDER and J. A. HUMMEL (*Minnesota Sta. Bul. 89, pp. 191–212, pls. 2*).—This bulletin gives the results of 3 investigations relating to the fertility of soils as follows: (1) The influence of crop rotations and use of farm manures upon the humus content and fertility of soils, (2) the water-soluble plant food of soils, and (3) the production of humus in soils.

The first of these investigations is a continuation of work previously reported upon (E. S. R., 13, p. 546) and gives a summary of studies during 1900–1904, "of the effects upon the fertility of 12 years continuous cropping compared with crop rotations and the use of farm manures." These studies show "that when grains are grown continuously there is a heavy loss of nitrogen from the soil, caused by decay of the

[a] Trans. Amer. Soc. Civ. Engin., 15 (1886), p. 581.

humus of which nitrogen is one of the component parts. When grains are grown in a rotation with clover, and farm manures are applied to the corn crop, the losses of nitrogen and humus are reduced to a minimum and the crop-producing power of the soil is increased."

The second investigation reported in this bulletin has already been briefly noted in the Record (E. S. R., 16, p. 28). It was designed to show by means of cultures in sterile sand the extent to which plants can utilize the mineral food dissolved in the soil water. It was found that "when wheat, oats, and barley were supplied only with soil leachings they failed to make a normal growth and to produce seeds, showing that water alone acting upon a fertile soil is not sufficient to supply a crop with its mineral food, but a large part is taken in other forms and that it is necessary for the farmer by means of cultivation, manures, and rotation of crops to increase the reserve plant food of the soil, not soluble in water, so as to secure maximum yields."

The third investigation was a continuation of similar studies reported in previous bulletins (E. S. R., 11, p. 1018). As in the previous experiments subsoil contained in a series of boxes was mixed in different cases with casein, albumin, wheat gliadin, and other organic compounds. "In some of the boxes known amounts of mineral substances were also added. The boxes were exposed out of doors for one year to allow humification to take place. Previous to exposure, samples of the soil and of the various organic substances used were analyzed and after the close of the year they were again weighed and analyzed." The object of these experiments was to show the extent to which the proteid compounds of feeding stuffs and manures combine with the inert phosphoric acid and potash of the soil to form humates. The loss of nitrogen during the process of humification and the form in which nitrogen exists in humus were also studied. The results show that appreciable amounts of the phosphoric acid and potash of the soil entered into combination with the organic matter during the process of humification and were thereby rendered more soluble. There was at the same time a loss of nitrogen. Little of the nitrogen remaining in the humus was in amid form, "the larger portion being in forms allied to insoluble proteids and not readily acted upon by a dilute acid pepsin solution.

"In the process of humification, an appreciable amount of the organic matter is rendered soluble and is obtained in the soil leachings."

The value of humates as plant food is briefly discussed.

A comparison of the organic matter in different soil types, F. K. CAMERON (*Jour. Amer. Chem. Soc.*, *27* (*1905*), *No. 3*, *pp. 256–258*).—The results of determinations by a method previously noted (E. S. R., 15, p. 744) of organic matter in 1,340 samples of soil and 1,220 subsoils representing 237 soil types are summarized.

"The average content of organic matter for all these samples is 2.06 per cent for the soil and 0.83 per cent for the subsoil. . . . An examination of the results seems to indicate that, generally speaking, the range of color of the soil within any given soil type varies in the order of the content of organic matter. The color of a soil, however, is by no means a safe indication of its content of organic matter. . . . The variation in the total organic matter in different samples of the same soil type is fully as great as between samples of different types. . . . Not only has the mineral matter an important part in determining color, but further, the organic matter in different soils is of a widely different nature. . . .

"For these reasons the Bureau of Soils proposes in the future to omit the determination of the total organic matter as a regular integral part of the mechanical analysis of a soil, except in special cases when it is obviously of importance in defining a type."

Contribution to the knowledge of the products of weathering of silicates in clay, volcanic and laterite soils, J. M. VAN BEMMELEN (*Ztschr. Anorgan. Chem.*, *42* (*1904*), *No. 3*, *pp. 265–314*).—The author claims that extraction of a soil with hydrochloric acid by ordinary methods gives no accurate knowledge of the

products of weathering mainly because the extraction of silica is incomplete. This can be obtained by alternate extraction with acids and with alkali solutions. The author's method involves in general successive treatment with hydrochloric acid (3 to 5 gm. of soil with 50 to 100 cc. of acid), increasing in strength from 1.035 to 1.2 sp. gr. at temperatures rising from 55° C. to boiling for periods varying from 5 minutes to 1 hour, followed by 2 extractions for 5 minutes at 55° C. and ½ hour at boiling temperature, respectively, with sodium or potassium hydroxid solution of 1.04 sp. gr., and finally in some cases heating with concentrated sulphuric acid (5 to 10 cc.) until the larger part of the acid is evaporated. In case of very basic soil the treatment with alkali precedes that with acid and is continued for a longer time than that given above. The insoluble residue is examined microscopically.

This method has been used in a study extending over many years of the clay soils of the recent alluvium of the Netherlands and of the volcanic soils of Sumatra and Java, in which the author has attempted to ascertain the relation between silica and alumina, their chemical combination in products of weathering, and whether they have a definite solubility in acids and alkalis; to determine whether products of weathering contain alkaline bases; and whether the iron oxid of soils is free, or absorptively, or chemically combined.

The results of studies of a large number of alluvial plastic clays, soils of volcanic origin, and laterite soils, which are summarized, show that the ratio of alumina to silica is not constant. With the ordinary alluvial clays the results indicated that the weathering had taken place in a single stage, while with the volcanic and laterite soils there were various stages of weathering resulting in a mixture of silicates. The progress of weathering was best shown in the laterites, the final product being hydrargillit. Alkaline and alkaline earth bases were present in varying amounts, diminishing with the progress of weathering. The ordinary clays contained much loosely combined water—lost at 15° C. over concentrated sulphuric acid—and about 2 molecules of water which was lost at higher temperatures. The laterites examined apparently contained little loosely held water and more than 2 molecules of firmly fixed water only when hydrargillit was present. The more basic the products of weathering the more readily they dissolve. The iron oxid of the soils examined contained a little more than 1 molecule of water at ordinary temperature and a little less at 100° C.

The importance of a fixed relation between amount, strength, and temperature of solvent, and the amount of soil, etc., is emphasized. The constitution of the products of weathering as well as the process itself are discussed.

Index to the mineral resources of Alabama, E. A. Smith and H. McCalley (*University, Ala.: Geological Survey of Alabama, 1904, pp. 79, pls. 6, map 1*).—"This document is intended rather to direct the attention of those interested to the various natural resources of the State which are considered capable of being profitably utilized, and to the sources from which more detailed information may be derived, than to be a complete or adequate presentation of the subject."

The mineral products noted are classified under (1) materials used in the manufacture of iron, (2) clays and cements, (3) miscellaneous, the latter including among other materials the following, which are of special interest from an agricultural standpoint: Niter, phosphates (silurian, cretaceous, and tertiary), building stones, road and ballast materials, and soils.

"For convenience in the discussion of its soils, the State may be divided into two parts, approximately coextensive with the mineral district and the agricultural district, respectively.

"In the first the soils are in the main residual, i. e., they have been derived from the rocks upon which they now rest, and show, therefore, more or less close relationship to them. In the second, the Coastal Plain or agricultural district, the cretaceous and tertiary formations have been overspread with a mantle of sandy loam

and pebbles, transported from elsewhere, and the soils are in great measure made from these materials, modified, however, locally by admixtures with the disintegration and decomposition products of the underlying older rocks."

The soils of the mineral district are derived mainly from sandstones, shales, and limestones, although in each case there are admixtures of material from other sources which give rise to a great variety in the resulting soils. There are three prominent types of these soils, (1) sandy loams, in part slightly calcareous; (2) calcareous sandy loams, and (3) highly calcareous clayey loams. The upland soils of the Coastal Plain are in the main based on materials derived from the Lafayette formation, which as a mantle of sandy loam and pebbles has been spread over the entire district to an average depth of 25 ft. When unmodified by admixtures these soils are highly siliceous loams, usually colored a deep red by iron oxid. "They are well drained, well situated, and among the most desirable of our farming lands, because of these qualities and of the ease of working and capability of improvement. At the other extreme they are very sandy and comparatively infertile in the natural state, yet some of the most valuable truck farms of southern Alabama have soils of this class. . . .

"Where the limestones of the Selma chalk and of the St. Stephens underlie and constitute the country rocks, the soils show marked departure from the prevailing type of Coastal Plain sandy loams. From these areas the Lafayette sands have often been in great part swept away by erosion, and the soils are in a measure residual, being the insoluble clayey residues from the decay and disintegration of the limestones.

"Like all clayey soils derived from limestones, they are of exceptional fertility, and make the very best farming lands of the State. Such are the soils of the great Black Belt or Canebrake Belt of central Alabama, and those of the lime hills and hill prairies of the southern part of the State. Remnants of the Lafayette mantle occur at intervals through all these regions, and admixtures of the red loams of this mantle with the native marly soils give rise to many varieties, such as the Red Post Oak soils, the Piney Woods Prairie soils, etc.

"Another departure from the prevailing Coastal Plain sandy loams is caused by the great clay formation of the lower tertiary, which gives origin to the Post Oak Flatwoods of Sumter and Marengo counties. East of the Alabama River in Wilcox and Butler counties, these clays hold much lime and form regular 'prairie' soils, characteristically developed along Prairie Creek in Wilcox.

"Besides the above, there are small areas of marly soils in the tertiary, due to the shell beds which occur at intervals in the lower or lignitic division of this formation. . . .

"In the lower counties of the State the materials of the Lafayette are in general more sandy than is the case farther north, and we find in this section also another surface mantle, viz., the Grand Gulf, underlying the Lafayette, and like it consisting mainly of sands with some beds of laminated clay intercalated. . . .

"Along all the larger streams of the Coastal Plain region we find developed normally three well-defined terraces. The first terrace or bottom is subject to overflow and its soils are the sands and other materials periodically deposited by the stream, and are the most recent perhaps of the formations. A few feet above the high-water mark and consequently not subject to overflow except in the depressions caused by erosion, are the second bottoms, with very characteristic soils, yellowish silty loams increasing in sandiness from above downward. The second bottoms are on an average perhaps a mile in width, and are always choice farming lands. Upon this terrace are many of the great plantations of ante-bellum days.

"About 100 ft. above the second bottom we find a third terrace averaging some 3 miles in width, the soils of which are of the usual Lafayette type, red sandy loam underlain by pebbles."

Division of soils, R. H. Loughridge (*California Sta. Rpt. 1904, pp. 28–34*).—This is a summary account of the work of the year ended June 30, 1904, and includes notes on the importance of careful sampling and on methods of sampling, a description of the soil exhibit prepared for the Louisiana Purchase Exposition, and statements regarding a reexamination of soils from the Salton Basin and Imperial region, work in soil physics (mainly moisture determinations, mechanical analyses, and some studies of capillary rise and percolation of water), the preparation of an agricultural map of the State for the Louisiana Purchase Exposition, examination of minerals, etc.

Soils of the Province of Buenos Ayres, Argentine Republic, R. J. Huergo (*An. Min. Agr. Argentina, Sec. Agr. (Agron.), 1 (1904), No. 2, pp. 12–59, map 1*).—This article forms part of a detailed report on the agricultural conditions of this province. It discusses in detail the general physiography and agricultural condition of its soils, the physical constitution and chemical composition of the soils, and gives analyses of a large number of soils with corresponding subsoils of the province. The general characteristics of the soils of different districts in the province are shown on a colored map.

Soils of the Province of San Luis, Argentine Republic, A. L. Cravetti (*An. Min. Agr. Argentina, Sec. Agr. (Agron.), 1 (1904), No. 5, pp. 21–65, figs. 2*).—This is one chapter of a detailed report on the agricultural conditions of this province and deals with the general physiographic conditions, color, composition, quality and deficiencies of soils, and the characteristic vegetation of the region. Analyses of 51 samples of soil, with corresponding subsoil, are reported and discussed.

Analysis of Spanish soils (*Abonos Químicos, 5 (1905), No. 50, pp. 25–27*).—A summary is given of analyses of 861 samples of soils from different provinces of Spain.

Nitrification and denitrification in cultivated soils, F. Löhnis (*Centbl. Bakt. u. Par., 2. Abt., 13 (1904), No. 22–23, pp. 706–715; abs. in Chem. Centbl., 1905, I, No. 8, p. 624*).—Denitrification is shown to be inconsiderable in well-aerated soils. Protein formation is also inconsiderable because of an insufficiency of assimilable organic matter. Nitrification generally exceeds antagonistic processes because the conditions in soils are usually more favorable to nitrifying organisms than to others. Under certain conditions all three processes may go on at the same time in the soil.

FERTILIZERS.

On the agricultural value of humus, J. Dumont (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 4, pp. 256–259*).—A further study of the causes of the effectiveness of the humus fertilizer described in a previous article (E. S. R., 16, p. 244) is reported in which this fertilizer was tested alone and in various combinations with phosphatic slag, superphosphate, and barnyard manure on beets, potatoes, corn, and alfalfa.

The humus fertilizer gave good results both alone and in combination with manure. The mineral phosphates gave very poor results when used alone on soils which had been regularly manured for 30 years, but the addition of organic manures increased the effectiveness of the phosphates.

Six hundred kilograms per hectare of the humus fertilizer supplying 13.2 kg. of nitrogen, 17.4 kg. of phosphoric acid, and 34.6 kg. of potash gave much better results than 20,000 kg. of manure per hectare furnishing 86 kg. of nitrogen, 74.5 kg. of phosphoric acid, and 92 kg. of potash. The difference in efficiency is attributed to a difference in the constitution of the humus material (*matière noire*).

In the case of the humus fertilizer this is readily nitrifiable and contains humophosphates, or phospho-humates, which are readily disseminated in the soil and assimilated by the plant, being superior in this respect to mineral superphosphates

containing large amounts of calcium sulphate, which interferes with the action of the phosphoric acid.

The valuation of the manurial residues of feeding stuffs, A. Smetham (*Reprinted from Roy. Lancashire Agr. Soc. Jour. 1903, pp. 12*).—This is a review of the report of a committee appointed to draw up a scale of compensation for unexhausted improvements (E. S. R., 14, p. 1057).

On the preparation of bone meal, A. Grau (*Jour. Agr. Prat., n. ser., 9 (1905), No. 10, p. 309*).—The method generally used in France is briefly described.

On manuring with kainit, S. Suzuki (*Bul. Col. Agr. Tokyo Imp. Univ., 6 (1905), No. 4, pp. 405–419*).—The literature of investigations relating to the fertilizing value of kainit, especially the effect of the chlorids present, is reviewed, and pot experiments with peas, beans, buckwheat, and rice to determine the nature and extent of the influence exerted by the chlorids and the magnesia present are reported. It is reported that in all the experiments the kainit acted favorably and there was nothing to indicate that the chlorin or magnesia content interfered with the growth of the plants. The author therefore is inclined to believe that cases of depression of yield by kainit must be restricted to soils which contain an excess of chlorids or magnesia, a condition which can be corrected by applications of lime.

The development of technique in the fertilizer industry from the beginning to the present time, Klippert (*Ztschr. Angew. Chem., 18 (1905), No. 9, pp. 321–327*).—This is a brief review of the development of apparatus and methods, especially in Germany.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1905, No. 27, pp. 52*).—The results of analyses of fertilizers inspected from July, 1904, to January, 1905, inclusive, are reported.

Commercial fertilizers, W. Frear (*Pennsylvania Dept. Agr. Bul. 132, pp. 69*).—This bulletin gives the results of fertilizer inspection in Pennsylvania during the 5 months ended December 31, 1904.

Licensed commercial fertilizers, F. W. Woll (*Wisconsin Sta. Bul. 120, pp. 5, 6, 10, 11*).—Analyses of 12 fertilizers licensed in Wisconsin during 1905 are reported and the text of the State fertilizer law is given.

Working in Great Britain of the fertilizers and feeding stuffs act, 1893, Burghclere et al. (*Rpt. Dept. Com. Bd. Agr. and Fisheries [Great Britain], 1905, pp. III+38*).—This is a report of a committee appointed by the Board of Agriculture and Fisheries to inquire into the efficiency of this act as a means of preventing fraud. The general conclusion reached is that while the act has in general been of great benefit to the farming class in suppressing many forms of fraud and in causing manufacturers to exercise more scrupulous care in the preparation of their products, it has not been of as great benefit as it was hoped it would be to small farmers who are most in need of its protection. This is attributed mainly to apathy and lack of information on the part of the small farmers, and the remedy proposed is education in its widest sense. Detailed recommendations, which it is believed will render the enforcement of the law more efficient and beneficial, are made. Among these recommendations are greater care in sampling to secure representative and authentic samples, the requiring of a guaranty of composition, more uniform methods of analysis and of procedure in prosecution of violations of the law.

FIELD CROPS.

Results obtained in 1904 from trial plats of grain, fodder corn, field roots, and potatoes, W. Saunders and C. E. Saunders (*Canada Cent. Expt. Farm Bul. 48, pp. 58*).—This bulletin is the annual report on variety tests now in progress for 10 years at the Canada Experimental Farms. Earlier reports have been previously noted (E. S. R., 15, p. 861).

The average yield for 36 varieties of spring wheat tested on all the experimental farms in 1904 was 28 bu. 2 lbs. per acre. Of 27 varieties tested for 5 years Preston and Red Fife led, with an average yield of 35 bu. 33 lbs. and 35 bu. 9 lbs., respectively. Advance, Monarch, White Fife, Huron, White Russian, Rio Grande, and Wellman Fife, given in the decreasing order of yield, all produced over 34 bu. per acre for the same period. Nineteen of the varieties of spring wheat tested are crossbred varieties produced on the experimental farms. The varieties Rio Grande, Herisson Bearded, and Colorado are not recommended to be grown for ordinary milling purposes. The 4 varieties of macaroni wheat grown on all the farms during the year gave an average yield of 32 bu. 54 lbs. per acre. Roumanian and Goose grown for 5 years yielded on an average 39 bu. 10 lbs. and 37 bu. 32 lbs. per acre, respectively. Common and red emmer grown on all the farms in 1904 gave an average yield of 2,448 and 1,980 lbs. per acre; and red and white spelt, of 1,808 and 1,362 lbs. per acre, respectively.

Forty-two varieties of oats under trial in 1904 produced on an average at all the farms 74 bu. 31 lbs. per acre. Twenty-three varieties tested for 5 years show a range in average yield from 73 bu. 3 lbs. to 84 bu. 3 lbs. per acre. The most productive varieties, given in the decreasing order of yield, were Banner, Abundance, Lincoln, Holstein Prolific, Danish Island, and Wide Awake, all producing over 80 bu. per acre for the 5 years. Of the varieties under test, 7 are crossbred sorts produced on the farms.

The average crop of 20 varieties of six-rowed barley for the season was 49 bu. 22 lbs. per acre. The average yield of the same varieties for 5 years ranged from 41 bu. 18 lbs. to 54 bu. 44 lbs. per acre, and 14 of the varieties yielded over 50 bu. per acre. Mensury ranked first, with Odessa and Common second and third, respectively. Fifteen varieties of two-rowed barley during this same season gave an average yield of 45 bu. 21 lbs. per acre. The 2 leading varieties were French Chevalier and Danish Chevalier, yielding on an average for 5 years 51 bu. 14 lbs. and 50 bu. 8 lbs. per acre, respectively. Of the six-rowed and two-rowed varieties, 13 and 9, respectively, are crossbred sorts originated at the farms.

The average yields of 31 varieties of peas tested for 5 years ranged from 35 bu. 6 lbs. to 38 bu. 34 lbs. per acre, and the average yield for the season was 43 bu. 2 lbs. per acre. The leading varieties, Crown, Early Briton, Pride, Arthur, and Macoun, all yielded over 38 bu. per acre for 5 years. Sixteen of the varieties under test were originated at the farms.

Nineteen varieties of Indian corn tested on all the farms in 1904 gave an average yield of 15 tons 1,585 lbs. per acre. The highest average yield for 5 years, 19 tons 1,020 lbs. per acre, was produced by Superior Fodder. Each of 17 varieties under test for 5 years produced an average yield of more than 15 tons per acre.

The average yield of 17 varieties of turnips on all farms for 5 years was 30 tons 297 lbs. per acre for the first sowing, and 24 tons 1,399 lbs. per acre for the second sowing. Perfection Swede and Hartley Bronze gave the best general results, being followed by Mammoth Clyde, Carter Elephant, Hall Westbury, Magnum Bonum, Imperial Swede, Drummond Purple Top, Halewood Bronze Top, and Elephant Master, with yields of over 30 tons from the first sowing. The average yield of 20 varieties on all the farms in 1904 was 30 tons 1,854 lbs. per acre from the first sowing and 25 tons 1,731 lbs. per acre from the second.

The average yield of 11 varieties of mangels grown on all the farms for 5 years was 29 tons 742 lbs. per acre from the first sowing and 24 tons 577 lbs. per acre from the second sowing. The largest average yields for this period are in favor of Mammoth Long Red, Mammoth Yellow Intermediate, Giant Yellow Intermediate, and Lion Yellow Intermediate, given in the order of productiveness. In 1904, 16 varieties grown on all the farms produced 25 tons 877 lbs. per acre from the first sowing and 21 tons 188 lbs. per acre from the second.

In reporting the data for carrots no results are considered at one of the farms for 1904. The average yield of 10 varieties grown on the farms for 5 years, including 1904, was 20 tons 1,663 lbs. per acre from the first sowing and 17 tons 1,196 lbs. per acre from the second sowing. Giant White Vosges and New White Intermediate were the leading varieties, each yielding over 23 tons per acre from the first sowing. Ontario Champion, Mammoth White Intermediate, Improved Short White, and White Belgian also gave an average yield of over 20 tons per acre. The average yield of 10 varieties grown in 1904 was 21 tons 646 lbs. per acre from the first sowing and 17 tons 1,229 lbs. from the second.

The data for sugar beets excluded the results at one of the farms in 1904. The average yield of 6 varieties for 5 years was 23 tons 168 lbs. per acre from the first sowing and 20 tons 652 lbs. from the second; while 8 varieties tested in 1904 gave an average yield of 20 tons 843 lbs. per acre from the first sowing and 17 tons 1,860 lbs. from the second. Red Top Sugar was the heaviest yielder, followed by Danish Improved and Danish Red Top, the average yield of these varieties for 5 years being over 30 tons per acre.

The average crop of 41 varieties of potatoes on all the experimental farms for 1904 was 374 bu. 18 lbs. per acre. Thirty-one varieties under test for 5 years ranged in average yield from 320 bu. 52 lbs. to 421 bu. 33 lbs. per acre. Rose No. 9, Late Puritan, Carman No. 1, Uncle Sam, Burnaby Mammoth, Seedling No. 7, and Dreer Standard, enumerated in the decreasing order of yield, show an average production of over 400 bu. per acre.

The culture substations, A. V. Stubenrauch (*California Sta. Rpt. 1904, pp. 134–196, figs. 2*).—A report on field work in continuation of that previously noted (E. S. R., 15, p. 764). On the test-culture plats at the Foothill Substation the following yields of green substance per acre were secured from the 5 best plants grown in 1903: Berseem 18,295, white lupine 11,477, horse bean 11,003, and Egyptian lupine 9,641 lbs. The berseem was sown October 29, and experience has shown that early sowing is imperative. Sowings of white lupine made October 22 gave practically double the yield secured from sowings made October 1 and November 1 and 15. The use of 200 lbs. of seed per acre gave a much better yield than the use of 100 or 150 lbs., but 95 lbs. when sown in drills gave nearly as large a yield as 200 lbs. broadcasted. Several of the crops successful the year before gave smaller yields this season. These tests included crops for forage and green manuring, grains, and grasses, and the results obtained on all plats are given in a table.

In nearly all cases this year the best crops of hay were obtained from the use of nitrate of soda on both red and granite soils where phosphates had been used the previous year. Sulphate of potash at the rate of 300 lbs. per acre, given with nitrate of soda, proved unprofitable. When used alone, nitrate of soda gave the largest profits given in a single application at the rate of 160 lbs. per acre. Data for all hay plats are recorded.

At the San Joaquin Valley Substation all test plats were under irrigation. The largest yield of green forage, 48,853 lbs. per acre, was obtained from *Medicago pulvinata aculeata*. All plants of the genus Medicago gave promising results. The Tangier pea (*Lathyrus tingitanus*) produced 38,433 lbs. of green substance per acre, while the Ochrus pea (*L. ochrus*), one of the best winter crops in other sections, gave only 5,029 lbs. The yields of other species of Lathyrus were as follows: *L. sativus* 24,403, *L. cicer* 23,137, *L. annuus* 15,130, and *L. clymenum* 12,069 lbs. per acre. The best 4 vetches were cordate-leaved vetch, yielding 23,132 lbs.; sweet vetch, 22,415 lbs.; hairy vetch, 21,265 lbs., and *Vicia varia*, 20,878 lbs. Horse beans and lupines gave satisfactory results. One variety of fenugreek failed entirely, while the other proved promising, with a yield of 15,518 lbs. of green forage per acre. The common lentil, the chick pea, and large water grass (*Paspalum dilatatum*) gave promising results. Berseem seemed unsuited to the Tulare region.

At the Southern California Substation the heaviest yield of green substance per acre during 1903 was secured from Egyptian lupine, the yield being 45,012 lbs. per acre. The lupines are subject to injury from maggots, and hence are not a sure crop. In yield the lupines were followed by a variety of horse bean, with 44,528 lbs. of green material per acre. This plant seems to be the most promising green manure plant tested at the station. The field peas have also been found one of the most satisfactory green manure crops for southern California. The vetches all made a good growth. Of the genus Medicago, California Burr clover gave the best results this year. Fenugreek was not as promising as in localities near the coast. Berseem, probably due to late sowing, was a failure. As for the other stations, the results obtained on each plat are shown in a table, and data from test-plat cultures on alkali land are also recorded.

The economic garden of the Central Station, A. V. STUBENRAUCH (*California Sta. Rpt. 1904, pp. 110-132, figs. 5*).—A tabulated list is given of plants which may be used for green manure and for forage, and of others suitable only for green manuring or for forage. Nearly all of the plants tested were leguminous plants. The time for fall planting ranged from October 20 to November 17, and the lengths of the germination periods from 7 to 13 days, 10 or 11 days being about an average. The lupines and clovers germinated in about 6 or 7 days; lentils, horse beans, Ochrus pea, and most of the vetches in from 10 to 12 days, and some of the last-named plants in 14 days. For California conditions the best plants for green manuring are those which will produce the largest quantity of green substance per acre before the plowing season. In this respect horse beans headed the list, with yields ranging from a little less than 30,000 lbs. to more than 68,000 lbs. per acre. Next to the horse beans stood 3 varieties of field peas, *Pisum arvense hibernicum*, *P. arvense vernale*, and *P. arvense punctatum*, with yields of 45,405, 43,106, and 36,209 lbs. of green substance per acre, respectively. The Ochrus pea yielded 43,681 lbs. per acre. This plant produces a matted growth somewhat more difficult to plow under than the horse beans. The results obtained with several other species of Lathyrus were also promising. Among other species of Vicia, common vetch (*V. sativa*) stood first with a yield of 51,152 lbs. per acre. Black-purple vetch (*V. atropurpurea*) stood next, with 44,255 lbs., followed by several other species, all yielding over 35,000 lbs. per acre. The best lupines were the small white lupines (*Lupinus angustifolius diploleuca*) and the succulent lupine (*L. affinis*), each yielding 32,186 lbs. It is recommended that lupine seed should be soaked for 20 minutes before planting in a solution of 1 pt. of formalin to 50 gal. of water. Berseem sown October 30 produced 33,335 lbs. of green material per acre, but was injured in February by a temperature of 21° F. The sowing made in April was a failure. California Burr clover produced only 16,093 lbs. of green material.

In addition to the plats with leguminous plants, 4 plats were sown with oats, 71 with barley, 2 with rye, 4 with durum wheat, and 10 with bread wheats. A list of grasses added to the collection during the season is also given.

Experiments in progress from 1900 to 1905 and extension of the different lines of work, K. VON RÜMKER (*Mitt. Landw. Inst. Univ. Breslau, 2 (1904), No. 5, pp. 832-879, figs. 2*).—In connection with the first report on the experimental field of the University of Breslau at Rosenthal the different experiments in progress, including rotation, fertilizer, culture, and variety tests, together with plant-breeding work, are described and the results thus far obtained briefly noted.

The composition of a number of varieties of fodder beets is shown in tables and the data indicate that the ash content varies with the variety and has apparently no relation to the dry matter content. The protein content was also subject to fluctuation, but bore some relation to the dry matter, inasmuch as it increased with the same. The sugar content also increased with the dry matter, and the same was true for crude fiber and nitrogen-free extract.

The work in rye breeding has shown that Petkus rye tends more toward the production of green-grained than yellow-grained strains. The plants with green-colored stems produced the longest and softest straw, being followed in these respects by the plants with bluish stems which, however, produced a more compact form of culm and head. The most perfectly formed plants were those producing bluish kernels. The straw in the yellow and brown-grained forms was shorter than in the strains just mentioned, while in the greenish and short-grained form it was shortest. The transmission of color was most intensive in the blue strains while the yellow forms transmitted their color characteristic more slowly but quite definitely, and the green forms more or less irregularly.

A cross between wheat and *Ægilops ovata* is reported as having been obtained. Breeding experiments with wheat and barley are in progress and the variations observed in the plants produced are discussed. Observations on the prolificacy of rye plants were made and the number of heads, blossoms, and kernels produced in 8 different tests is recorded.

The results of field experiments indicated that rye is a surer crop than wheat, and that among spring wheat varieties Green Mountain and Strube Bearded gave most promise of being successful, although not always the best yielders at the station. Noë and Red Schlanstedt wheat and Goldthorpe barley proved sensitive to drought. Hanna barley seemed most drought resistant. Lüneburger Kley and Beseler II oats and Strube Early Victoria peas are recommended. The squarehead forms of winter wheat sometimes winterkill. The best varieties of potatoes were Magnum Bonum, Kaiserkrone, Frauenlob, Saxonia, Early Zwickau, Paris Sugar, Up-to-Date, Fürstenpreis, and Mühlhaus.

Alfalfa growing, A. S. HITCHCOCK (*U. S. Dept. Agr., Farmers' Bul. 215, pp. 39, figs. 8*).—This bulletin gives the history, description, and distribution of alfalfa; discusses its requirements of soil and climate and its cultivation, and presents directions for its use in crop rotations and as a seed, hay, pasture, silage, and soiling crop. Notes are also given on the feeding value and the enemies of the plant. "Special effort has been made to secure data applicable to the Eastern and Southern States, where experience with the crop is most limited."

Alfalfa culture in humid lands, J. E. WING (*Pennsylvania Dept. Agr. Bul. 129, pp. 64, figs. 3*).—This bulletin treats of the history, habit of growth, and uses of alfalfa, and gives directions for the culture of the crop in a humid climate such as prevails in the Eastern States. Among the more important topics discussed are inoculation of the soil, care and treatment of alfalfa meadows, making alfalfa hay, enemies of the crop, feeding value, and plowing up alfalfa sod.

In the directions for securing a good stand special stress is laid upon the preparation of the soil, the kind of seed, and the manner of sowing. The necessary porous condition of the soil may be obtained by tile draining and the use of heavy applications of bulky manure. After the land has been heavily manured it should be plowed deeper than usual and planted to a hoed crop in order to free it from weeds. After the crops are harvested a winter cover crop of rye or hairy vetch may be sown. The following spring the land should be plowed about 2 in. deeper than ever before. The soil is then mellowed as for corn.

Northwestern-grown seed sown at the rate of 7 to 12 lbs. per acre, and the use of a nurse crop for spring sowing are recommended for Pennsylvania. In this connection the author advises the use of oats drilled at the rate of 3 pk. per acre, or beardless barley at the rate of 4 to 5 pk. per acre.

The influence of barley and beets on the humidity of the soil and on a succeeding alfalfa crop, S. TRETYAKOV (*Khutoryanin, 1903, No. 46; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 4, pp. 541–543*).—The results given in the following table were obtained on the Poltava Experiment Field in experiments with fodder beets, barley, and alfalfa, conducted from 1888 to 1900, inclusive.

Average soil humidity in beet and barley fields and in fields growing alfalfa after beets and barley.

Depth.	Beet field.	Barley field.	Alfalfa.	
			After beets.	After barley.
Inches.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
0.0 to 10.5	14.76	13.96	20.29	21.42
10.5 to 28.0	13.64	13.31	18.18	17.23
0.0 to 28.0	14.09	13.97	19.02	18.94
28.0 to 56.0	14.12	13.08	17.64	11.16
0.0 to 56.0	13.98	13.62	18.40	15.48

The soil humidity in the beet fields was greater than in the barley fields. The following year, when the field was put into alfalfa, this higher moisture content of the soil was still perceptible, and even marked in the deeper layers. The yield of alfalfa was about the same whether it followed beets or barley.—P. FIREMAN.

Yields and keeping qualities of fodder beets, F. WOHLTMANN ET AL. (*Separate from Illus. Landw. Ztg., 24 (1904), No. 86, pp. 30*).—The yields of the different varieties under test have already been noted (E. S. R., 16, p. 559). Studies on the keeping qualities were made during two seasons. The beets were analyzed before and after storing under dirt cover in the field. The first season the average content of dry matter during 164 days of storing was reduced from 12.3 to 9.6 per cent, while in weight, due to a higher moisture content, the beets increased 5.6 per cent. The loss in dry matter represented the loss in sugar, which varied largely with the different varieties, ranging from 21 per cent in some to over 60 per cent in others. The largest loss in sugar was sustained by the varieties low in sugar and high in moisture content. The constituents other than sugar showed but slight variations.

The second year the beets were stored in 2 lots, the first being covered with soil immediately upon harvesting and the second allowed to lie in small piles for about 18 days after digging and then hauled together and covered with earth. In the spring the first lot showed an average increase in weight of 6.4 per cent and the second of 4.7 per cent. Of the first lot 93.8 per cent were in good condition, while of the second only 83.8 per cent were free from decay. The varieties low in sugar and high in moisture had been most subject to rotting. The results of the second year in general confirmed those of the first. The authors recommend planting sufficiently early to bring about complete development before the beets are harvested and to store immediately, the work being preferably done in dry, cool weather. In order to raise the total sugar production the beets should be planted rather closely, the distance of 40 by 25 or 30 cm. being suggested as adequate for most sorts. Since the loss in sugar is heaviest in beets low in sugar and of a high moisture content, these should be fed first and only those rich in sugar stored for later feeding. In breeding fodder beets the characters sought should be a satisfactory yielding capacity, a high sugar content, a low moisture content, and a good keeping quality. It is not considered profitable to give special attention to increasing the protein and the fat content.

Essential steps in securing an early crop of cotton, R. J. REDDING (*U. S. Dept. Agr., Farmers' Bul. 217, pp. 16*).—Steps in the preparation of the soil, the use of fertilizers, the selection of the variety, and in planting and cultivating cotton for the purpose of securing early maturity are described. The results of experiments at the Georgia Station in spacing cotton, previously noted (E. S. R., 3, p. 691; 4, p. 813), are again reported and a table is given showing the actual and comparative yields per acre of certain early varieties of cotton and the average yields of all the varieties tested for 15 years at this same station. The proportion of total crop secured in the

first and second pickings is taken as the most convenient and effective means of determining the relative earliness of different varieties. The bulletin is summarized as follows:

"Prepare the soil thoroughly and early, beginning with fall plowing. Fertilize liberally and judiciously, carefully avoiding an excess of nitrogen. On rich, dark, alluvial, and freshly cleared soils phosphoric acid alone, in the form of acid phosphate, may be applied. Apply fertilizers in the drill and bed on them. Broadcasting is rarely, if ever, expedient. Choose an early maturing and productive variety f cotton , and plant on the beds and as early as possible. Apply in the seed furrows 40 to 75 lbs. per acre of quickly available fertilizer, preferably 25 to 40 lbs. of nitrate of soda. Reduce to a final stand as quickly as possible. Let cultivation be frequent and shallow. Narrow rows with wide spacing of plants in the rows will result in a greater early yield than will wide rows with close spacing."

Report on cotton cultivation in the British Empire and in Egypt, W. R. Dunston (*London: Darling & Son, Ltd., 1904, pp. 40, map 1, dgms. 2*).—This report describes the cultivation of cotton in the United States, Europe, Africa, Asia, and Australia. The improvement of the British supply of cotton with special reference to India is discussed by Sir George Watt. A bibliography on the subject of cotton and cotton culture is also given.

The cowpea in the North, A. Agee (*Pennsylvania Dept. Agr. Bul. 130, pp. 41*).—The object of this bulletin is to point out the value of the crop for Pennsylvania and to give directions for its culture and use under the conditions prevailing in the State. The results of experiment station work are largely drawn upon in the discussion of the different topics.

The growth of crimson clover (Trifolium incarnatum), C. L. Penny (*Delaware Sta. Bul. 67, pp. 54, dgms. 3*).—Experiments were made to determine the nitrogen content of crimson clover in its early spring growth and when in full bloom. For the purpose of this study the clover was cut at different stages and the roots were dug up to a depth of 6 in. The crop was grown under field conditions on different types of soil, and in studying the yield of dry matter the weight of the total air-dry material and its distribution between the tops and the roots was considered.

It was found that about one month before full bloom the tops and roots weigh from 37 to 60 per cent as much as at full bloom, and that the plant is on an average about half grown. If plowed under at this stage the quantity is smaller but it decays faster than if allowed to reach full growth. The roots constitute from 12 to 50 per cent and average about 30 per cent of the whole plant, and have but little connection with the stage of growth. The air-dry matter in the tops ranged from 14 to 27 per cent and seemed to increase slightly toward full bloom. The yield of nitrogen from the entire plant ranged from 139 to 188 lbs. per acre, with the exception of one case, in which it reached 216 lbs. Thirty days before full bloom the yield of nitrogen amounted to from one-half to fourteen-fifteenths of the yield at full bloom. When grown on soil on which the crop had previously been grown the plants seemed to get the most of the nitrogen comparatively early in their growth, while when grown on soil for the first time the nitrogen increased slowly at first and the greatest gain was made during the last month, so that early plowing in the one case is likely to cause a much smaller loss in nitrogen than in the other. From 12 to 50 per cent of the total nitrogen in the plant was found in the roots and the stage of growth did not seem to affect its distribution between the tops and the roots. About one-fourth of the total nitrogen in the plant is in the parts under ground, and it is estimated that the nitrogen left in the soil, in the stubble, and in the roots after mowing is, on an average, from 35 to 40 per cent of the total nitrogen of the crop. During the 30 days preceding full bloom the nitrogen content of the tops was reduced about 1 per cent and that of the roots about $\frac{1}{3}$ per cent.

Attention is called to the fact that not all the nitrogen of the crop is assimilated from the atmosphere, but that some of it, and probably in some cases most of it, is taken from the supply already in the soil and therefore represents no gain in nitrogen fertilizer. This is most likely the case where crimson clover takes up most of its nitrogen in the early period of growth.

Of the nitrogen in the tops about 0.4 is in the stems, 0.3 in the leaf blades, and the rest in the blossoms. After full bloom the blossom became richer in nitrogen than any other part of the plant. The quantity of potash in the crop ranged from 63 to 185 lbs., and in an exceptional case, to 255 lbs. per acre. During the last 30 days before full bloom the quantity usually increases and the percentage in the tops is always greater than in the roots, which contain from 4 to 27 per cent, or an average of about 17 per cent of the total potash in the plant. The yield of phosphoric acid from the entire plant ranged from 11 to 38 lbs. per acre. The percentage of phosphoric acid was rather uniform. It is estimated that during the 30 days preceding full bloom the crop gained in the money value of nitrogen from $0.94 to $9.07 per acre, and the total money value of nitrogen in the matured crop ranged from $16.72 to $22.54, and that of the 3 essential elements together, from $20.57 to $32.84 per acre.

The growth of crimson clover (Trifolium incarnatum), C. L. PENNY (*Delaware Sta. Bul. 67, abridged ed., pp. 24, dgms. 2*).—This bulletin is an abridged edition of Bulletin 67, noted above.

Experiments in grass culture, H. J. WHEELER and G. E. ADAMS (*Rhode Island Sta. Bul. 103, pp. 17–45, pls. 2*).—Experiments were conducted to determine the most economical quantities of acid phosphate, nitrate of soda, and muriate of potash to be used annually on grass land where commercial fertilizers only are applied. The land under experiment was seeded to barley, common red clover, timothy, and redtop in 1898, and has now been in grass for 6 years. The details of earlier years of the experiment have been previously noted (E. S. R., 15, p. 32).

The first 2 years the full application of nitrogen consisted of 450 lbs. of nitrate of soda and in subsequent years of 400 lbs., furnishing 71 lbs. and 63 lbs. of nitrogen per acre, respectively. The nitrogen was applied with sufficient phosphoric acid and potash. The results for the 6 years show that without nitrogen an average of 1.76 tons, with one-third the full application 2.51 tons, and with the full application 4.03 tons of field-cured hay was secured per acre. The best stand of timothy during the 6 years and the highest market grade of hay was obtained where the full ration of nitrate of soda was used. Determinations of the shrinkage in barn-curing the hay showed that it ranged from about 13 to 19 per cent. It was found that where the full application of nitrate of soda was used a ton of field-cured hay removed from the soil 13.1 lbs. of nitrogen, 32 lbs. of potash, and 6.5 lbs. of phosphoric acid. In each of the 3 years in which the determination was made more nitrogen was supplied in the full ration than was removed by the crop. With potash and phosphoric acid alone the value of the crop per acre exceeded the cost of the fertilizers on an average per year by $8.40, with one-third the full nitrogen application by $15.88, and with the full application by $30.27.

For 3 years an experiment was conducted on 2 plats to determine the best application of phosphoric acid per acre. An average annual yield of 4.16 tons of barn-cured hay per acre was obtained where 40 lbs. of phosphoric acid was supplied, and 4.54 tons of field-cured hay where 60 lbs. per acre was used. The yields per acre from the entire test ranged from 3.5 to 5.01 tons of field-cured hay. The heavier application of phosphoric acid proved most profitable.

The potash test was conducted on the same plan as the experiment with phosphoric acid. The annual application consisted of 150 lbs. of potash per acre on the one plat and 200 lbs. on the other. The average annual yield of field-cured hay where 150

lbs. of potash was used was 5.1 tons per acre, and where 200 lbs. was used, 5.3 tons. Taking the experiment as a whole, the yields ranged from 3.85 tons to 6.76 tons per acre. The author's calculation shows an apparent advantage of $1.15 per year per acre in favor of the larger application of potash, but owing to the fact that the plat receiving the smaller quantity produced the larger crop the year before the test was begun, the present results are considered inconclusive. The data derived from the experiments show that good financial returns may be obtained from grass culture with the use of commercial fertilizers alone. The use of 400 to 500 lbs. of acid phosphate and 300 to 350 lbs. each of muriate of potash and nitrate of soda per acre applied from April 15 to 25 is suggested as being best adapted as an annual top dressing on land where a good stand of timothy and redtop already exists, where a too great degree of soil acidity does not prevail, and where commercial fertilizers only are used. Brief directions for seeding grass lands are given.

Fertilizer experiments on meadows, P. Liechti (*Landw. Jahrb. Schweiz, 18 (1904), No. 11, pp. 491–530, fig. 1*).—The results of experiments carried on for 6 years are given. The fertilizers were applied in different combinations and quantities. A good yield of hay was obtained on the check plat, but the use of liquid manure and commercial fertilizers produced a marked increase in yield amounting to almost 50 per cent where phosphoric acid and liquid manure were given together. Phosphoric acid and potash in combination gave a much higher increase in yield than either element applied alone. The application of lime gave indefinite results but largely promoted the growth of leguminous plants. It is shown that annual applications of potash were necessary to keep the production of the meadow at its maximum. The use of superphosphate and Thomas slag did not increase the quantity of phosphoric acid taken up by the plant to a very great extent, while potash and liquid manure alone reduced the content of phosphoric acid. The percentage of potash in the hay increased with the quantity of potash applied to the soil. The amount of nitrogen removed in the crop was greatest when Thomas slag and kainit were given. The use of superphosphate and kainit also produced a marked increase of nitrogen in the plants. In the tests with single elements the percentage of nitrogen was highest on the potash plat.

Superphosphate alone seemed to reduce the proportion of leguminous plants, while Thomas slag did not have this effect. Potash alone increased the grasses and reduced the quantity of leguminous plants by 3.5 per cent. The applications of superphosphate and kainit and of Thomas slag and kainit gave a considerable increase in the grasses and a marked decrease in other species. A heavy application of potash given with phosphates increased both grasses and leguminous plants. A complete fertilizer promoted the growth of grasses at the expense of all other species. Liquid manure alone and in combination with superphosphate was most effective in increasing the proportion of grasses. The best financial returns were obtained from the use of liquid manure and superphosphate, bone meal and kainit, and Thomas slag and kainit.

Hop experiments, 1904, A. Howard (*County Councils Kent and Surrey, Southeastern Agr. Col. Wye, Bul. 1, 1904–5, pp. 29, pls. 8, figs. 4*).—A description of the male and female flowers of the hop is given, and the results of experiments carried on at different centers are recorded. In cross fertilization experiments it was noticed that young hops which were not pollinated remained in blossom for a much longer period than those which were pollinated. Hops artificially pollinated started to grow out at once, while those which had received no pollen began their growth a week to 10 days later. Fertilization seemed to stimulate the growth, to hasten ripening, to improve the color, and to increase the mold-resisting power of the plant. An examination of nearly ripe hops showed that no well-developed plants were without seeds; it was further noticed that fully developed seed hops and poorly developed, unripe

seedless hops were often to be found on the same vine, and it is believed that pollen was probably not available when the late hops were ready for pollination, and in order to obtain all the hops on a vine in a well-developed condition pollen must be available during the whole flowering period. Further investigations showed that mold did more damage to the seedless hops than to those producing seeds. The advantages of growing seed hops as indicated by these investigations are the production of large, heavy, bright-colored, and well-grown specimens, early ripening, and increased mold-resisting power; and the disadvantages, the space taken up and the trouble involved in growing suitable male plants, the possible difference in brewing value between seed and seedless hops, and the possibility of the more rapid exhaustion of the hills through the more frequent formation of perfect seeds. The directions in which further work on this subject should be carried out are briefly noted.

Experiments were made with Bordeaux mixture as a remedy for mold. The effect was twofold; the mold was destroyed on the infected leaves and prevented on the sprayed leaves, while the foliage of the treated plants turned to a darker green, this difference in color being perceptible until the end of the season.

The disadvantage in the Butcher system of training, as observed by the author, is that the angle made by the breast wire tends to harbor lice and mold which are not touched in spraying. The use of the thermometer in hop-drying experiments is described and the relative value of different methods of obtaining the temperature records are compared.

At Selling, where the fertilizer experiments are in their eighth year, in 1903 a plat receiving barnyard manure at the rate of 30 loads per acre gave nearly half a cwt. more hops than a plat receiving a thin dressing every year, and both these plats were considerably in advance of one treated with commercial fertilizers only. In 1904 all 3 plats gave practically the same yield.

At Frant in the sixth year of the work gypsum gave the most marked results, 10 cwt. of the substance per acre giving an increase of 2½ cwt. of dried hops over the check plat. These results are similar to those obtained in previous years. Sulphate of potash at the rate of 5 cwt. per acre has given an average increase in yield of 1½ cwt., and as in previous years, produced a greater vigor of growth and delayed ripening of the hops, with a consequent loss of brightness in the sample.

The results obtained at Farnham during a series of years show a marked effect produced by lime on a soil deficient in carbonate of lime. As in previous years, the culture experiments at Goudhurst show that the plat receiving no cultivation gave the highest yield.

Culture of legumes and the nitrogen question, F. HANSEN (*Ugeskr. Landm.*, *50* (*1904*), *Nos. 44*, *pp. 493–495; 45*, *pp. 510–513*).—A discussion of the value of different forage plants, with special reference to the protein content.—F. W. WOLL.

Temperature in its relation to storing potatoes, F. PARISOT (*Jour. Agr. Prat.*, *n. ser.*, *8* (*1904*), *No. 50*, *pp. 763–765; abs. in Rev. Hort.* [*Paris*], *77* (*1905*), *No. 1*, *p. 8*).—A temperature of 8° C. is considered the best for storing potatoes, either for use as food or for seed. At this temperature the respiratory combustion and the formation of starch are considered as offsetting the formation of sugar, and that at a higher temperature the quantity of sugar is smaller and at a lower temperature greater. At a higher temperature, therefore, no appreciable quantity of glucose and saccharose would be present, while at a lower temperature the formation of sugar would be greater than the quantity consumed in the processes of respiration and starch formation. The sweetish taste developed in stored potatoes is attributed to this cause and is believed not to be necessarily due to freezing.

On the culture of sugar beets in central Sweden, S. RHODIN (*K. Landt. Akad. Handl. och Tidskr.*, *43* (*1904*), *No. 1–2*, *pp. 20–42*).—A discussion of the adaptability of this region for sugar-beet culture, leading to the recommendation of the growing of this crop for the manufacture of sugar or for feeding farm animals.—F. W. WOLL.

The preparation of tobacco seed, A. D. SHAMEL (*Connecticut State Sta. Bul. 148, pp. 4*).—The value of using good seed is discussed and a method of separating heavy and light seed by means of a current of air is described.

Protein content of the wheat kernel, J. N. HARPER and A. M. PETER (*Kentucky Sta. Bul. 113, pp. 12, figs. 2*).—Studies on the relation between certain physical characters of the wheat kernel and its chemical composition, and a proposed method for improving wheat by seed selection, are reported. The station has observed that introduced flinty wheats under Kentucky conditions have a tendency to become softer, but that this change has not been complete in any of the varieties under test from 3 to 10 years. Some of the kernels were flinty, angular in outline, semitranslucent, and of a dark amber color, while others were plump, starchy in appearance, and light in color. The proportion of flinty kernels differed greatly in the different varieties. Analyses of the 2 types of kernels were made, and the results are given in a series of tables. In every instance the flinty kernels contained more protein than the starchy ones. Pootung wheat showed a difference of 5.88 per cent of protein between the starchy and the flinty kernels and Rudy of 1 per cent, being the largest and smallest differences, respectively, among 19 varieties. The difference was more than 4 per cent in Pootung, Beachwood Hybrid, Jersey Fultz, Pearl Prolific, and Improved Rice. Pootung stood highest in protein content of flinty kernels with 16.55 per cent, being followed by Improved Rice with 15.17, Beachwood Hybrid with 14.95, Extra Early Oakley with 14.68, and Jersey Fultz with 14.66 per cent. The widest variation in protein between any two samples, 7.44 per cent, was found between the flinty kernels of Pootung and the starchy kernels of Dawson Golden Chaff. The large and medium sized flinty kernels were richer in protein than the smaller ones. The small kernels near the base and tip of a head of Pootung wheat were lower in protein than the larger kernels from the middle of the head.

An examination of a large number of separate heads showed that the kernels of any one head differed but little in physical appearance except in respect to size. It was also observed that the grains from the several heads of any one stool were all either flinty or starchy, while the grains from different stools often differed materially in this respect.

Heads of Turkish Red wheat were gathered before it was quite ripe and a week later when fully ripe. The unripe heads contained 49.4 per cent of flinty kernels and the mature heads 47.6 per cent, and of these kernels the protein content was 10.23 and 11.26 per cent, respectively. From these results it is concluded that the flinty kernels are not immature. Analyses also showed that flinty kernels stored in a dry place retain more moisture than starchy ones, and that starchy wheat absorbs moisture more rapidly than flinty wheat. It was found that early wheats are richer in protein than late-maturing varieties. Nine varieties ripening before June 20 averaged 14.70 per cent and 6 varieties ripening after June 22 averaged only 12.41 per cent of protein in the flinty kernels. The starchy kernels were more uniform in composition, but also showed a falling off in protein in the later varieties.

The results led the authors to believe that flinty kernels from the middle of the head should be selected from early-maturing varieties for developing a high protein type of wheat. In testing the hardness of wheat no definite relation was established between the percentage of protein and the pressure required to cut the grains in two.

Season and crop report of the Central Provinces and Berar for the year 1903–4, B. P. STANDEN (*Dept. Land Records and Agr., Central Provinces, Season and Crop Rpt. 1903–4, pp. 47*).—The season and the production of the different crops is discussed and general agricultural statistics are presented in tables.

Report on the season and crops of the Punjab for the year 1903–4, W. RENOUF (*Dept. Land Records and Agr., Punjab, Season and Crop Rpt. 1903–4, pp. 10+XIX*).—The agricultural production for the year is discussed, and statistics with reference to the different crops are tabulated.

HORTICULTURE.

The culture substations, A. B. STUBENRAUCH (*California Sta. Rpt. 1904, pp. 134–196*).—An account in continuation of that previously given (E. S. R., 15, p. 773) of the fruit yields at the Foothill, San Joaquin Valley, and Southern California substations. Some data on forage and hay crops included within these pages are noted elsewhere (p. 963). Owing to lack of funds and to the completion of the work outlined, the Southern Coast Range and Foothill substations have been discontinued. The report given consists essentially of tabulated data showing the yields and other characteristics of a large number of varieties of apples, pears, quinces, almonds, apricots, peaches, nectarines, plums and prunes, cherries, figs, walnuts, olives, persimmons, grapes, oranges, and lemons grown at one or more of the different substations.

In the case of the Foothill Substation, the data are tabulated for the crops grown on red soil and on granite soil. The yield of grapes at the San Joaquin Valley Substation continues to be very satisfactory, averaging about 6.5 tons per acre in 1903 as compared with 7 tons per acre in 1902. At the Southern California Substation, a series of fertilizer experiments with citrus fruits has been planned. The work will include about 100 acres of citrus orchards in the Riverside and Pomona valleys. Different fertilizers and combinations of fertilizer elements, both with and without the use of green manure crops, will be used in connection with irrigation. Packing and shipping experiments will also be carried out in cooperation with the Division of Pomology of this Department.

[Horticultural work at] Hope Experiment Station, Jamaica (*Ann. Rpt. Pub. Gard. and Plantations Jamaica, 1904, pp. 9–17*).—A report is given outlining the work at the station with bananas, citrus fruits, date palms, citronella grass, lemon grass, grapes, pineapples, rubber, vanilla, cacao, naseberries, avocado pears, and nutmegs. From one-fifth of an acre of citronella grass (*Andropogon nardus*), planted in May, 1903, a total of 1 ton 4 cwt. of grass was cut the following December. A portion of this grass was distilled, but the quantity of oil obtained was so small that it was not considered advisable to continue the experiment. It is estimated that the cost of cutting and cultivating the plat and distilling the grass was a little over $6. The oil was submitted to European commercial chemists, who stated that it had an exceptionally fine odor and closely resembled the fine Java citronella oil, being somewhat intermediate between that oil and the normal Ceylon distillates. Some experiments were also made in distilling the flowers of *Cananga odorata*. Very successful results are reported in budding mangoes, cacao, naseberries, avocado pears, and nutmegs. It is believed that the new methods devised for budding these various plants will greatly aid in the development of agriculture in the Colony.

Report of the Nova Scotia School of Horticulture, F. C. SEARS (*Ann. Rpt. Sec. Agr., Nova Scotia, 1904, pp. 51–67, pls. 5*).—An outline is given of the experimental work during the year with a list of the varieties of fruits in the experimental orchards. Experiments with Bug Death in comparison with a number of standard insecticides led to the conclusion that this is not a satisfactory material for spraying apple trees either to destroy insects or to prevent attacks of fungus pests. Experiments to determine whether an excess of lime in Bordeaux mixture would cause rusty spots on apples led to negative results, no more rusty spots appearing on the fruit sprayed with an excess of lime in the Bordeaux mixture than where the lime was just sufficient to neutralize the sulphate of copper in the mixture. Black knot has been practically eradicated from the plum orchard by systematic cutting out of the knots in summer as soon as they appear and thorough spraying with Bordeaux mixture.

Experiments and observations during the past 7 years with reference to cover crops indicate that crimson clover is one of the most satisfactory at the station for this purpose. Very promising results were secured during the season with winter vetch.

This plant forms a thick mat over the surface of the ground, which makes an ideal cushion on which apples that fall are not bruised to any extent. Seeding cover crops about July 5 has resulted most satisfactorily.

A good many fruit trees were killed by severe cold during the winter of 1903–4. Careful examination of different orchards indicates that those trees which had been stimulated by fertilizers or late cultivation and were thus somewhat sappy were most seriously injured.

Comparative fertilizer and vegetation experiments with lime nitrogen on garden vegetables, R. OTTO (*Gartenflora, 53 (1904), No. 20, pp. 534–538*).—Field and pot experiments were made to determine the value of lime nitrogen ($CaCN_2$) as a fertilizer for garden vegetables in comparison with nitrate of soda and sulphate of ammonia. The field experiments were carried out on light garden soil that unfortunately had just received a dressing of stable manure. The different fertilizers were applied in such a manner that all the plats received equivalent amounts of nitrogen. The lime nitrogen and sulphate of ammonia were first mixed with dry earth and then raked into the soil about 3 in. deep before the seed was sown. The nitrate of soda was not used until about 7 days later after the plants were up.

In the first experiment 3 varieties of spinach were used. The lime nitrogen in the early stages of growth of the plants had an injurious effect on all 3 varieties. As growth continued this injury was gradually overcome, and at harvest time the plants were practically equal to those grown with nitrate of soda or sulphate of ammonia, and much superior to those grown on the plats which received stable manure alone.

In the field experiment with head lettuce the lime nitrogen had an injurious effect when the plants were brought in contact with it in a fresh condition, but when the plants were first brought in contact with it 12 days after it had been applied as good results were secured as with nitrate of soda or sulphate of ammonia.

In the pot trials 18.5 lbs. of garden soil was used in each pot to which 5 gm. of nitrogen in each of the different forms was added. The lime nitrogen and sulphate of ammonia were mixed in each case with the entire quantity of earth and the plants set 4 days later. The nitrate of soda was mixed only with the surface soil and not applied until about 2 weeks later. For about 11 days after the plants had been put in the pots those fertilized with lime nitrogen remained behind the others. The plants did not appear sick, however, and the leaves were greener than plants in the other pots. From then on the plants in the lime-nitrogen pots grew more vigorously and finally surpassed all the others, the relative figures being as follows: Lime nitrogen, 460; sulphate of ammonia, 425; nitrate of soda, 200; unfertilized, 200. The heads were much more solid in the pots fertilized with lime nitrogen and sulphate of ammonia than in the others.

In experiments with corn the pots were prepared practically the same as for cabbage, 5 kernels being sown in each pot. Germination was equally good in all cases. All plants but one were then removed from each pot. At harvest time the yield of the plants in the lime-nitrogen pots was considerably higher than in the other pots, the relative figures being 11 for lime nitrogen, 9 for nitrate of soda, and 7 for sulphate of ammonia.

Salad plants, as in the field experiments, were seriously injured by the use of fresh lime nitrogen, even where the lime nitrogen was placed 3 in. deep. Like results followed when the lime nitrogen was mixed with the entire quantity of earth and the plants not set in the pots until 3 days later. When the plants were first set 8 days after mixing they had a sickly appearance, the leaves turning brown and dying. They gradually overcame the trouble, however, and in about 4 weeks assumed a normal appearance. When the plants were not set out until 14 days after the lime nitrogen had been mixed with soil no injury followed, neither did any injury follow when it was mixed with the soil 5 to 10 in. below the surface.

The experiment is to be continued. On the whole it appears that lime nitrogen is a valuable fertilizer for garden vegetables.

The constituents of celery, M. BAMBERGER and A. LANDSIEDL (*Monatsh. Chem., 25 (1904), pp. 1030–1034; abs. in Analyst, 30 (1905), No. 346, p. 22*).—Fresh root stalks were found to contain mannit, asparagin, and tyrosin. Leucin was not found. The amount of asparagin isolated from different samples was fairly constant, being about 0.005 per cent. The proportion of tyrosin present was very small.

Methods of marketing fruits, vegetables, flowers, and poultry (*Bul. Mens. Off. Renseignements Agr., 4 (1905), No. 1, pp. 15–28*).—A description is given of the packages used in France and the methods observed in the packing and shipment of all kinds of vegetables, fruits, flowers, and poultry.

Results from fertilizing orchard fruits, CLAUSEN (*Landw. Jahrb., 33 (1904), No. 6, pp. 939–960, pl. 1*).—A detailed account is given of extensive experiments in fertilizing apple trees with a number of different commercial fertilizers. Unfortunately after the experiment was begun it was found that the orchard had recently been heavily fertilized, as a result of which the effect of the fertilizers in the experiment was to retard or depress growth. Some minor results were obtained, however, which are interesting. It was found that the comparative growth of different trees could be as readily compared by measuring the thickness of the stem as by measuring the length. The variety Schöner von Boskoop grew much more rapidly under all conditions than the Baumann Reinette variety. The depressing effect of the different fertilizers was least noticeable when they were applied at the beginning of March rather than later. The use of nitrogenous fertilizers also decreased the injurious effect of overfertilization with potash and phosphoric acid.. Sulphate of ammonia was superior to nitrate of soda for this purpose. The use of nitrogenous fertilizers tended to lengthen considerably the growing period of the trees. It could not be determined that this was injurious, though the experiment extended over a period of 3 years. The after effects of nitrogenous fertilizers were still very prominent the second year. It was thought that since the trees in the experiment were overfertilized with mineral fertilizers that the twigs would contain an unusually large percentage of ash. Analyses, however, did not confirm this belief.

Winterkilling of peach trees. Report of investigations in the Lake Erie fruit belt, W. J. GREEN and F. H. BALLOU (*Ohio Sta. Bul. 157, pp. 115–134, figs. 9*).—Great losses were sustained during the winter of 1903–4 by fruit growers of the Lake Erie peach belt, especially those of Catawba Island and the peninsula of eastern Ottawa County, from injury to the trees by severe and prolonged cold. Some entire orchards were destroyed and many orchardists ruined. Many contradictory features appeared throughout the affected regions. Some orchards were not injured at all. In others a row, section, or block of trees might come through in perfect condition, while all others were killed. Trees on imperfectly drained land might be killed outright in one instance and come through without injury in another. Like results were observable with trees on elevated land. Trees of the same variety often varied greatly in their susceptibility to injury.

The station horticulturist and his assistants visited injured and uninjured orchards in the affected region and made a study of the whole subject. The direct cause of injury was the intense and prolonged cold accompanied by deep and hard freezing. In addition there were many specific causes. Generally speaking, trees and orchards of low vitality suffered most. There were a number of specific conditions contributing to low vitality, such as an exhausted and insufficient degree of fertility, low physical condition of soil due to absence of vegetable matter, prevalence of San José scale, which in some sections killed the trees, and in others left them in so weakened a condition that they succumbed to the cold even after the scale had been combatted by spraying, leaf curl which by defoliation weakened the trees, borers, extremely dry condition of the ground when winter set in, and in some cases wet soil. Meth-

ods of cultivation in many affected orchards were such as to bring about a weakened condition of the trees, and thus to invite destruction at a critical period, such as the prolonged cold of the winter season of 1903–4. Specific examples of the injury occurring under each of the different factors are cited. Methods of culture which contributed to escape from injury are thus summarized:

"Providing that the orchards had been kept free from fungus disease and the San José scale, by timely and thorough spraying, no injury of trees was found where stable or barnyard manure had been used upon the ground within the last year or two previous to the winter of 1903–4; rarely was an injured tree found standing in sod; no injury was done where the surface of the soil, beneath the trees, had been covered with even a very light mulch; little injury was done where the trees stood in fairly well-drained soil containing a moderate amount of fertility and humus; no injury was found where the trees were under the grass mulch method of culture; . . . no injury was observed in any case where the stems of the trees had been slightly banked or mounded with a few shovelfuls or forkfuls of soil, peat, or manure.

"Very few trees which, within the past few years, had been affected with leaf curl or infested with San José scale or borers, remained alive or uninjured; and very few trees existing upon infertile or exhausted soil, depleted of humus, escaped uninjured."

The Tempe date orchard, A. J. McClatchie (*Arizona Sta. Rpt. 1904, pp. 474, 475*).—Statistics are given regarding the number of date trees in the orchard now living, number of new suckers, number of trees blooming, and number that have died during the past year, from which it appears that there is now a total of 448 trees comprising 105 varieties now growing at the station and 757 suckers. It is believed that practically all the varieties now under cultivation will succeed at the station.

The fig, L. Trabut (*Bul. Agr. Algérie et Tunisie, 10 (1904), Nos. 14, pp. 297–303; 15, pp. 321–328; 16, pp. 341–347; 17, pp. 361–368; 18, pp. 385–389, figs. 29*).—A popular account is given of the culture of figs in Algeria and Tunis with descriptions of the more usual varieties grown, of the insects and diseases affecting figs, and of the methods observed in drying figs.

Raspberries, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 213, pp. 37, figs. 25*).—This is a popular account of the culture of raspberries in the United States, including methods of propagation, cultivation, fertilizing, harvesting, winter protection, pruning, and the drying or evaporation of the fruit. Several different forms of evaporators are illustrated and described. A map is given showing the sections in the United States where the different species of raspberries are most extensively grown, with lists of varieties most suited for cultivation in each of the different districts.

Report on cranberry investigations, A. R. Whitson, E. P. Sandsten, L. P. Haskins, and H. Ramsay (*Wisconsin Sta. Bul. 119, pp. 77, figs. 37, map 1*).—An abstract of the present investigations, which were conducted in cooperation with this Office has been made from another source (E. S. R., 16, p. 778). Further details are here given regarding frost protection, cultural methods, varieties, irrigation and drainage ditches, and insect and weed pests, with descriptions and illustrations of the more important weeds. The surest protection against severe frosts is flooding. Heavy flooding is necessary only during the latter part of the season. During occasional periods in the summer when frost threatens it will seldom be necessary to flood so that the water in the ditches is raised above the surface of the ground. As a prevention of frost thorough drainage, sanding, and freedom from excessive vegetation have proven potent factors. With reference to this point the authors state that "the effect of thorough drainage by the use of deep and close ditches in aiding in protection from frost can hardly be overvalued. The State experiment station has gone through the past summer in which there were several frosts and one or two very hard frosts without any loss from freezing whatever, notwithstanding the fact that certain parts of the bog were not flooded once during the season. On other adjoining marshes flooding was resorted to many times during

the summer for protection and yet a loss of about 60 per cent of the total crop was sustained on the morning of August 8. While this protection at the station was not due to good drainage alone, there is no doubt that it had much to do with warding off the frost." Data are tabulated showing the higher temperature on bare sanded bogs over bogs covered with a mat of vegetation.

Detailed directions are given for laying large ditches and flooding. Observations relative to the value of sanding bogs indicate that vines on the unsanded bogs grew more rapidly and vigorously. Weeds also grew more vigorously. The use of choice varieties for planting is urged. The best time for planting seems to be from the first to the middle of May or about the time corn is planted. The most popular method of planting in the vicinity of Cranmoor is that of scattering the whole vines over the ground and stamping them into the muck with sod hooks or some similar device. Cutting the vines into short lengths and rolling them with a flange wheel has also given good results.

By attention to thorough weeding and good drainage vines at the experiment station have yielded at the rate of 62.5 bbls. per acre, while the average yield throughout the State during the same year was 5 bbls. per acre.

Experiments made in picking from September 8 to October 8 showed an increase in size of fruit during the 30 days of 19 per cent. There was an increase of 10 to 11 per cent during the first 16 days from September 8. It appears also that fruit fully matured when picked keeps better than immature fruit. Illustrations and a description are given of a successful grading machine.

Grape culture, G. C. BUTZ (*Pennsylvania Dept. Agr. Bul. 128, pp. 62, pls. 8*).—Popular directions for the culture of grapes with statistics of production in each of the counties of Pennsylvania. Nearly two-thirds of the grapes grown in Pennsylvania are produced in Erie County bordering on Lake Erie.

Failure of vines. Report of commission on alleged disease about Stellenbosch, R. DUBOIS ET AL. (*Agr. Jour. Cape Good Hope, 25 (1904), No. 6, pp. 693–702, fig. 1*).—Upon investigation it was found that instead of a disease which was affecting the vineyards, the principal causes of failure or partial failure were due largely to some one or more of the following causes: Insufficient drainage, insufficient initial preparation of the soil, use of stock unsuitable for the scion or the soil, failure to cut roots forming from the scion, too heavy bearing in connection with insufficient manuring, and too close planting. Suggestions to overcome these difficulties are offered.

Drainage of cacao land (*Agr. News [Barbados], 4 (1905), No. 73, p. 27*).—An account is given of the good effects following the drainage of cacao land in Dominica. The plantation lay near a river and apparently the natural drainage should have been sufficient. The soil, however, had become so compact during long cultivation as to respond remarkably to drainage. Trees which appeared to be slowly dying in the spring took on new life during the summer and presented a healthy, flourishing appearance in the fall. Further work by the Dominican planters along the same line is advocated.

The wild coffee trees of Mount Amber, Madagascar, M. DUBARD (*Agr. Prat. Pays Chauds, 5 (1905), No. 23, pp. 92–100, figs. 3*).—An illustrated account with botanical descriptions is given of 3 new varieties of coffee found on Mount Amber, Madagascar. These have been named respectively *Coffea gallienii*, *C. bonnieri*, and *C. mogeneti*.

Caoutchouc gathering on the Amazon River, E. ULE (*Beihefte Tropenpflanzer, 6 (1905), No. 1, pp. 1–71, figs. 11, map 1*).—The author made a caoutchouc exploration up the Amazon and some of its branches and here reports the results of his journey. Descriptions are given of 13 species of Hevea, which were collected, and of a number of other rubber-producing plants. A description is given of the country visited and of native methods of harvesting caoutchouc and preparing it for market.

Data are given on the export trade in this product, with suggestions on the culture of caoutchouc-producing plants and the future of the industry.

Methods of tapping rubber trees and collecting latex, P. J. Burgess (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 9, pp. 380–385*).—The advantages and defects of different systems of tapping rubber trees are discussed. The half herring bone method is believed to be the best method yet devised for tapping rubber trees, as the number of cups required by this method of tapping is reduced to a minimum. The method is capable of being systematically carried out on a large scale by coolie labor, and the plan of cutting is simple.

Experimental studies in arboriculture, L. Daniel (*Jardin, 18 (1904), No. 426, p. 342*).—The account here given is supplementary to that previously noted (E. S. R., 16, p. 466), in which it was shown that a sudden change in the functional capacity of a branch produced a series of monstrosities, among which the most frequent was the transformation of a woody branch into a floral branch during the same growing season. Some of the flowers which blossomed, in the case of pears under consideration, formed pears more or less modified. It was found that these pears instead of maturing about the first of September did not mature until early in October. The pears were more brilliantly colored than usual and in some of them the dried stamens and also the 5 styles, somewhat thickened and fleshy, persisted. There was a marked change in the flesh of the fruit also, the melting flesh of the normal type being very firm and crisp in the late pears. It is proposed to propagate from plants thus affected to see if these abnormal changes are of a permanent character.

Root pruning pecans, H. W. Stringfellow (*Texas Farm and Ranch, 24 (1905), No. 3, pp. 10–12*).—The author holds that the usual ill success in transplanting the pecan is due entirely to leaving too long a tap root. He advises cutting off the tap root to a length of 4 or 5 in. and setting the tree at least 6 in. deeper than it was before taken up.

Chestnut culture in Pennsylvania, N. F. Davis (*Pennsylvania Dept. Agr. Bul. 123, pp. 50, pls. 45*).—This bulletin is largely a description of the methods observed by C. K. Sober, of Lewisburg, Pa., in growing the Paragon variety of chestnut by grafting native sprouts arising from the stumps of cut-over chestnut lands. Considerable compiled data on the food value of the chestnuts, etc., reprinted largely from publications of this Department, are also incorporated.

The Paragon chestnut appears to make especially good unions on native stock. Whip grafting has given the most satisfactory results. When cleft grafting was practiced and professional grafters employed, only about 5 per cent of the grafts were successful. Much better results, 80 to 90 per cent of perfect unions, were secured by personally directing inexperienced men and using the whip graft. Grafting is done for the most part in May, and the scions kept dormant by burying them among cakes of ice in the ice house until needed. The sprouts which arise from the lowest part of the stump are most desirable for grafting purposes, as they appear to root better. Any buds below the graft must be rubbed off, otherwise they absorb the nutriment and the graft above dies from starvation. Fire lanes in the grove are made before grafting begins, as fire is the most serious problem to contend with in chestnut groves. Trees begin to bear when 2 or 3 years from the graft. It has been found advantageous to cut back the first year's growth in the fall to a stub 3 or 4 in. long containing 2 to 3 buds.

In growing trees from seed Mr. Sober has found it desirable to keep the nuts buried in sand over winter rather than to plant in the fall. The nuts are not removed from their winter quarters until they have sprouted. Two methods of planting are then observed. By one method "the nuts are planted in shallow drills, care being taken to lay the sprouts in a horizontal position, covering them about one and one-half inches deep with soil, the nuts having been planted about one foot apart in rows 2 or 3 ft. apart. This will allow them to be cultivated with a horse. The tap-

root having been placed in a horizontal position will very soon send off numerous fibrous roots, and the seedling can be transplanted to the orchard at any time." Another method is to plant the nuts in shallow drills as before and cut off the sprout, which is the taproot, close to the nut. "The taproot having been cut off will now send out numerous fibrous roots, and the seedling can be transplanted to the orchard without danger." Nuts thus planted will be ready for grafting in about 3 years. The budding of chestnut seedlings has not proved a success. Young chestnut trees found wild have been successfully removed to the orchard and grafted with improved varieties. In this connection it is stated that over 1,000 wild-cherry trees have been grafted with the best varieties of cultivated cherries.

The effects of etherization on plants, W. J. BELTZ (*Jardin, 19 (1905), No. 430, pp. 26, 27*).—A discussion of the physiological effects of etherization on plants. The author believes that ether or chloroform occasions an extension of the cells through exterior excitation. This extension produces an enlargement of the cell capacity in the same manner as that produced on plants by the sun in the springtime.

Etherization in forcing, A. MAUMENÉ (*Jardin, 19 (1905), No. 431, pp. 44-46, figs. 3*).—The author states that the practice of etherization is meeting with much favor among florists in France. A description is given of an etherizing chamber, which may be installed in the forcing house, with detailed drawings of the various parts.

Some notes on carnation crosses, W. N. RUDD (*Amer. Florist, 23 (1905), No. 868, pp. 1045, 1046*).—The author has made about 1,500 carnation crosses and grown about 6,000 seedlings. His methods of crossing and growing carnations are discussed. A table compiled from 974 crosses made during 3 years shows that the percentage of the crosses which failed increased from 34 per cent with those made from November 20 to 30, to 65 per cent with those made from February 1 to 3. With the crosses made during the early part of the season, i. e., in November, an average of 15.5 seedlings were raised per pod, while with crosses made the first of February there were only 4.6 seedlings raised per pod. The author notes that the percentage of failure in these experiments was really larger than it need have been had more care been taken. One of the points which the author considers of the greatest importance in crossing is that the work be done on a bright sunny day and after the sun has been shining for some hours. "When the pollen is like dry dust, and scatters at a touch, the conditions are best. When the pollen is gummy and has a tendency to cohere at all, failure is almost certain."

All the foxgloves worth cultivating, F. A. WAUGH (*Gard. Mag., 1 (1905), No. 1, pp. 15, 16, figs. 4*).—This is a short monograph on the subject of foxgloves designed to bring our knowledge of the subject up to date. It describes 8 of the species which are most desirable for culture in this country and gives a key for their identification.

Extraction of essential oils and perfumes in France, R. P. SKINNER (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 1904, No. 291, pp. 259-262*).—An account of the methods observed in France in the extraction of essential oils and perfumes.

FORESTRY.

What forestry means to representative men (*U. S. Dept. Agr., Bureau of Forestry Circ. 33, pp. 31*).—This circular consists of portions of addresses delivered by different individuals before the American Forest Congress, held at Washington January 3-6, 1905, a preliminary account of which has already been given (E. S. R., 16, p. 627).

Manual of the trees of North America exclusive of Mexico, C. S. SARGENT (*Boston and New York: Houghton, Mifflin & Co., 1905, pp. XXIII+826, pl. 1, figs. 642*).—In this volume the author has brought together into a condensed and con-

venient form the material which was more elaborately worked out in his Silva of North America. The numerous illustrations were redrawn for the book by C. E. Faxon and serve as an important help in the recognition of the various species of trees. The volume contains a synopsis of families, an analytical key for the ready identification of families of trees, and the manual proper containing generic and specific keys and detailed descriptions of all trees growing in North America north of Mexico. The specific descriptions are concise, and helpful notes are given on the distribution and uses to which the different trees are put.

Forest conditions of northern New Hampshire, A. K. CHITTENDEN (*U. S. Dept. Agr., Bureau of Forestry Bul. 55, pp. 100, pls. 7, maps 2*).—An investigation was made of the forest conditions of the northern part of New Hampshire, the region covered embracing about 32 per cent of the entire State. It contains the entire White Mountain region and is drained by 4 large river systems, all of which have their origin within this region. The physiography of the region is described, after which the value of the land is commented upon and the ownership shown. A considerable proportion of the land belongs to large lumber companies, and the agricultural land, all of which is in small holdings, is less than one-sixth of the whole area. The lands are classified according to their forest growth and descriptions given of the different forest types. The rate of growth and reproduction in different regions following lumbering operations, fires, etc., is shown, after which the sylvicultural and other characteristics of the different species are described.

The author offers suggestions based upon his studies for the proper management of this region. These include the protection from fire, conservative lumbering, planting of farm wood lots, forest planting on denuded lands unsuited for agricultural purposes, and the adoption of a State forest policy which would include the proper officers for fire protection, and provide for a State forest nursery and popular instruction in forestry throughout the State.

Forestry management in Minnesota (*Agr. Expts., 4 (1904), No. 5, p. 83*).—A review is given of the management of the Minnesota Forest Reserve, which was established some 2 years ago by an act of Congress. This act regulated the sale of pine timber on 3,000,000 acres of land formerly belonging to the Chippewa Indians and at the same time set aside 225,000 acres as a forest reserve. The law required that on the 200,000 acres of pine land 95 per cent should be cut under regulations provided by the Bureau of Forestry, and the sales already made have netted a decided increase for the timber over the price which would have been obtained for both timber and land under the previous law.

Santa Monica Forestry Station (*California Sta. Rpt. 1904, pp. 196–204, figs. 9*).—The author reports very unfavorable weather conditions during the period covered by this report, the drought having been unprecedented in its extent. The growth of a number of species of pines, acacias, eucalyptus, etc., is shown, indicating their ability to resist drought. Many of the trees were entirely dead. Some of the species of eucalyptus not only survived the long season of drought, but made a fair amount of growth, although planted on steep hillsides. A lot of eucalyptus trees planted in blocks on the upper mesa survived the drought well, making considerable growth.

A report is given on the growth of a number of species of eucalyptus, the seed of which was obtained from the Section of Seed and Plant Introduction of this Department in January, 1901. These trees, which represent about 30 species, are now 2 years old, and the average growth of the 5 best specimens is shown in tabular form. These range from 7 ft. in height and 7 in. in circumference to 28 ft. in height and 18 in. in circumference. Notes are given on the germination and growth of eucalyptus in seed beds and flats.

Chico Forestry Station (*California Sta. Rpt. 1904, pp. 205–208, figs. 5*).—A report is given of changes in the equipment and management of the Chico station, together

with a brief account of the growth of the trees at the station. Unfavorable weather prevailed during the season, the tan bark and cork oak trees suffering severely. A large number of acorns of each species had been planted, and while about 50 per cent of the tan oaks germinated, 95 per cent of these failed to withstand the dry summer. The cork oaks did a little better. The eucalyptus trees made very poor growth, the failure being attributed in a large measure to a lack of thorough cultivation.

Chaparral in northern California, E. A. STERLING (*Forestry Quart., 2 (1904), No. 4, pp. 209-214*).—According to the author, the amount of chaparral land in California north of Sacramento is estimated at more than 200,000 acres. This region, aside from its value in conserving water, is practically worthless for grazing, for the production of timber, etc.

The chaparral is divided into two classes, that which has evidently been long in possession, and the more recent growth which has followed lumbering and fires. The first type of chaparral is found mainly on the higher elevations, while the second invariably follows the path of lumbering operations. Fire is also responsible for chaparral growth.

The examination of the chaparral shows the presence of a large variety of genera and species of plants. The bulk, however, of the thickets is composed of manzanita and Ceanothus. The more important species occurring in the chaparral are briefly described, after which the author discusses the encroachment of this growth. The chaparral is said to be a positive menace, as it encroaches upon regions that are adapted to more valuable uses than a mere watershed cover.

To reclaim chaparral by planting is not feasible, but the author suggests better protection of the mountain forests and the application of more business-like methods to lumbering, in order that the chaparral will not encroach upon the regions already forested with valuable species.

Forest conditions in the Absaroka division of the Yellowstone Forest Reserve, J. B. LEIBERG (*U. S. Geol. Survey Professional Paper No. 29, pp. 148, maps 2, dgm. 1*).—A report is given of investigations made by the author of the timber conditions of the Absaroka division of Yellowstone Forest Reserve, which was originally the Absaroka Forest Reserve. This division and the Teton and Yellowstone reserves were merged into the Yellowstone Forest Reserve in 1903. The portion reported upon embraces 1,334,400 acres, of which 37,200 acres are reported as wooded, 442,640 acres as forested, and the remainder nontimbered, which consists of badly burned areas, agricultural and grazing lands, barrens, lakes, etc.

The topographical features of the region are described at length, and the forest is said to be almost wholly coniferous, the principal species being lodgepole, limber, and white-bark pine, red and subalpine fir, and Engelmann spruce. The deciduous species are but very slightly represented, cottonwoods and various species of willows being most abundant.

The timber of the reserve valuable for commercial purposes is divided by the author into timber of sufficient dimension to furnish saw logs and timber fit only for fuel, poles, railroad ties, etc. Of the mill timber the Absaroka division is said to embrace about 972,000,000 ft. B. M., while the volume of pole and fuel timber amounts to 952,500,000 cu. ft.

The different portions of the reserve are described by townships, after which similar notes are given regarding the Livingstone and Big Timber quadrangles, both of which are situated in Montana.

The Cowthorpe oak, J. CLAYTON (*Trans. and Proc. Bot. Soc. Edinburgh, 22 (1904), pt. 3, pp. 396-414, pls. 7*).—A descriptive and historical account is given of this oak tree, which is situated in the village of Cowthorpe near Wetherby, and which is known throughout the botanical world as one of the most famous of oak trees.

Records of measurements are given extending from 1700 to 1893. These records indicate that the tree has suffered various vicissitudes of storms and other injuries,

and the data presented show that the tree has actually shrunken in size since the first recorded measurements. About 1700 the measurements, as reported in Evelyn's Sylva, showed that at that time the circumference of the tree at the ground was 78 ft. and the height was 80 ft. The measurements recorded in 1774 showed that it had attained a circumference of 81 ft. 6 in., but through damage by storms the leading branch had been torn away. Its dimensions in 1893, as measured by the author, showed a girth of 54 ft. 3 in. at the ground, and a height, including dead wood, of 37 ft. An explanation of this great diminution in diameter is given in that the tree, which, according to all measurements, tapered very rapidly, had through the loss of many of its roots actually sunken into the ground, so that the point of measurement at the later date was considerably above that which is recorded in the earlier figures. This supposition is also supported by the fact that the distance from the ground to the first principal branch has been a diminishing one.

Various estimates have been made as to the age of this famous tree, but according to the author it is probably about 500 years old.

Hybrid maples, F. Pax (*Mitt. Deut. Dendrol. Gesell., 1903, pp. 83–87; abs. in Bot. Centbl., 96 (1904), No. 49, pp. 585, 586*).—Brief descriptions are given of 12 hybrids between different species of the genus Acer, and the origin of the different hybrids is shown.

The effect of constitutional vigor of forest trees on the forest crop, J. Simpson (*Gard. Chron., 3. ser., 36 (1904), No. 935, pp. 362–364*).—A discussion is given of the relation of constitutional vigor of trees to the production of timber crops, and an account presented of plantations in which trees of the same age but of different vigor were planted and records kept.

A tract of 240 acres was planted 50 years ago to larch, in which there was a careful selection of vigorous trees for planting, and at the same time from the same nursery lot was planted a considerable number of smaller, weaker trees. Measurements were made showing that the trees having the weaker growth had continued throughout to be smaller and they have produced a mixed growth of less than half the value of that produced from the selected trees. Similar results are quoted for ash and sycamore.

As a result of the author's investigations he recommends that for forest, as well as other plantings where good growth is desired, care should be exercised in selecting the trees for planting.

Physiological investigations on the reserve materials of trees, Leclerc du Sablon (*Rev. Gén. Bot., 16 (1904), Nos. 189, pp. 341–368, figs. 7; 190, pp. 386–401, figs. 7*).—A study was made of the different parts of a number of trees and shrubs to ascertain the disposition and utilization of the reserve materials stored within them. Roots, stems, and leaves of the chestnut, pear, quince, peach, willow, and raspberry were studied, and the results are given at length.

Among deciduous trees the roots serve as storage places for carbohydrates. The maximum deposition of carbohydrate reserves is attained in the autumn. During the winter the carbohydrates gradually decrease, the starch apparently being transformed into a form of cellulose. In April and May the reserve carbohydrates in the roots disappear entirely, being used in the formation of new branches and new roots. From June to October the supply is renewed and stored up as before. In general, stems act in a similar manner in serving as storage places for reserve materials. As a rule comparatively little carbohydrate reserve material is permanently stored in the leaves.

The nitrogen content of stems and roots attains its maximum in the autumn, varies little during the winter, but attains a minimum in May or June, after which there is an increase. The leaves have a relatively higher nitrogen content early in the spring of the year, but the proportion falls rapidly. At the restoration of growth the stems and roots give up a large proportion of their nitrogen to the newly forming leaves and later receive it again as reserve nitrogen.

The fats which are extracted by ether seem to play a very unimportant part in the stems and roots of the plants studied. In the leaves the fat content increases from early in the spring to autumn, the fat appearing as a sort of by-product to photosynthesis.

The water content of stems and roots attains its maximum in the spring, passing to a minimum in the autumn. The actual amount of water in bulbs and tubers varies with the stage of growth and to some extent with the water content of the soil. The autumn is the period of most latent life, when the reserve materials are at their maximum and the water content at its minimum, while in the spring of the year the proportions are reversed and plant life is at its most active stage.

New method of healing and nourishing trees, S. MOKRZHETSKI (*Vyestnik Tavr. Zemstvo, 1903, Nos. 11, 12; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 4, pp. 550, 551*).—The author briefly communicates the results of his experiments with 500 trees in introducing into the trunks nutritive salts in the dry state and in solution. These salts were preparations after the formulæ of Knopp, Müller-Thurgau, Wagner, and Mokrzhetski. The experiments were made with oaks, poplars, sycamores which suffered from the frost, diseased white acacias, and pear and apple trees. In all cases the results were more or less favorable. Chlorosis was successfully treated with iron sulphate, as well as the anthracnose on the grapevine and some fungus diseases of the apple and the oak. Gummosis of some species was treated by introducing solutions of acetic, oxalic, and tartaric acids. By introducing solutions of arsenic, copper sulphate, manganese, and barium, the bark borer, apple moth, and one species of aphis were successfully combated. In some cases, however, the treatment was ineffective.—P. FIREMAN.

Methods for determining the volume of forests, C. FERNANDO (*Natal Agr. Jour. and Min. Record, 7 (1904), No. 11, pp. 1025-1036*).—Suggestions are given of methods for determining the volume of timber in artificially grown plantations where the woods are composed of trees of approximately the same age, with a complete leaf canopy. The methods suggested are based on three systems—the system of estimation, measurements extending over the whole forest, and the measurements of small plats.

A new timber seasoning process (*Forestry and Irrig., 10 (1904), No. 12, pp. 570, 571*).—In the experiments carried on by the Bureau of Forestry in seasoning telephone and telegraph poles, investigations will be conducted on the effect of submerging poles in water for various lengths of time. It is known that the sap of the green tree contains a number of soluble substances, and it is believed that the removal of these will to some degree eliminate the action of fungi. It is possible also that certain chemical and physical changes in the wood cells are produced by soaking. To test this, the Bureau of Forestry proposes the soaking of poles in the hope that the time required for seasoning may be reduced.

In addition to the removal of fungus injury the reduction in weight is an important consideration where the poles are to be shipped to any great distances, and by reducing the tendency to decay it will be possible to lower the present butt diameter requirement, which is now based on a certainty that rot will soon weaken the power of the pole to withstand strain at the surface of the ground.

Forest fires (*Forestry and Irrig., 10 (1904), No. 10, pp. 469-471*).—Notes are given on the principal forest fires for the month of September, the most serious losses being reported from Oregon, Washington, California, British Columbia, and Newfoundland. Minor fires are reported from Montana, Idaho, and Minnesota.

SEEDS—WEEDS.

The development of single-germ beet seed (C. O. TOWNSEND and E. C. RITTUE (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 73, pp. 23, pls. 8, figs. 6*).—This bulletin gives an account of preliminary experiments conducted for the purpose of attempting to develop a race of sugar beets which would produce single-germ seed. These are considered desirable for cultural reasons, principally the lessening of the expense of thinning and the probability of securing a stronger growth from a single seed ball than where a number of plants come from a multiple-germ seed cluster. The work has been carried on for 2 years, and some progress is noted.

The relative germination of single-germ seeds and multiple-germ seeds was tested, in which the percentage of germination of the single-germ seeds was considerably higher than the average of multiple-germ seeds. Further tests showed that the single-germ seeds sprouted in a shorter time than the multiple-germ seeds, the percentage of germination was higher, and the plants produced from single-germ seeds possessed greater vitality than the others.

A description is given of the greenhouse and field experiments which have been carried on under the authors' supervision, from which it appears that by cross pollination and selection there is an increased production of single germ seeds.

The seed characters of Pisum sativum, R. P. GREGORY (*New Phytol., 2 (1903), p. 226, fig. 1; abs. in Bot. Centbl., 96 (1904), No. 43, p. 424*).—In studying the histological nature of the difference between round and wrinkled peas used in Mendel's experiments the author found that round peas, which include the indented sugar peas, have the central tissues of the cotyledons filled with very large starch grains, often reaching 0.2 mm. in length. In the same region the starch grains of wrinkled peas are of a decidedly different type, frequently being compound. Such grains rarely attain a size of 0.2 mm., but the component starch grains never exceed 0.1 mm. Seeds of intermediate appearance as well as types which are known to contain seeds of doubtful affinities all proved on microscopical examination to have the starch grains of the round peas.

The effect of carbon bisulphid on the germination of peas, G. STAES (*Tijdschr. Plantenziekten, 9 (1903), pp. 119–124*).—The effect of carbon bisulphid on the germination of peas is shown. This chemical is commonly used to destroy the pea weevil (*Bruchus pisi*), and the author conducted experiments with several lots of peas which were exposed for 10 or 11 minutes to from 50 to 250 cc. of carbon bisulphid to each hectoliter of space. After treating the seed they were divided into several groups and tested. The results of the germination tests are shown in tabular form, from which it appears that the treatment retarded the germination to some extent, but the effect as shown in the total germinations was inappreciable.

The influence of temperature on the germination of seed, F. TODARO (*Staz. Sper. Agr. Ital., 37 (1904), No. 6, pp. 453–462*).—Investigations are reported on the germination of Italian rye grass, red and white clover, bird's foot clover, alfalfa, sainfoin, and sulla when subjected to the conditions of the thermostat, laboratory, and open field. The maximum and minimum temperatures in each experiment are given, as well as the total temperatures during the time of the tests. The germinations under each experiment are reported by short intervals, indicating the influence of high temperatures in hastening germination.

In general it was found that a strong fluctuation in temperature or a temporary lowering of the temperature in the field to below the minimum considered desirable for a given kind of seed does not permanently retard germination. The tests made in the laboratory at a somewhat higher temperature and with slight fluctuation gave in nearly every case a lower percentage of hard seed among the leguminous

seeds and consequently a higher percentage of germination. While the total number of seeds germinating in the laboratory was higher than that observed in the field, yet all the seeds germinating in the laboratory were not able to develop into plants at all comparable with those produced in the open field. In the experiments with alfalfa the highest germinations were obtained in the open air trials.

Wild hemp or sesbania, W. H. FORBES (*Arizona Sta. Rpt. 1904, pp. 494–496, figs. 2*).—Notes are given on the growth, habits, and possible uses of the wild hemp (*Sesban macrocarpa*). This is a leguminous plant very abundant in portions of Arizona and lower California, and it is believed to be of value on account of the long strong fiber borne in the stalks. The plant is also believed to offer considerable promise for green manuring.

Influence of chlorin water on germination, R. SPATSCHIL (*Oesterr. Bot. Ztschr., 54 (1904), No. 9, pp. 325–329; abs. in Bot. Centbl., 98 (1905), No. 1, p. 9*).—Soaking the seed of *Lepidium sativum* and other oil-containing seeds, such as radish, mustard, turnip, etc., in chlorin water for a short time was found to hasten germination. The influence of the chlorin water seemed to be wholly exerted with the softening and swelling of the seed coat, and it had no apparent effect on the subsequent growth of the seedling. Soaking peas, corn, rye, barley, and oats for a short time in chlorin water had a retarding effect on the germinative processes.

DISEASES OF PLANTS.

Specialization of parasitism in the Erysiphaceæ, E. S. SALMON (*New Phytol., 3 (1904), Nos. 2, pp. 55–60, figs. 3; 5, pp. 109–121*).—In the first of these papers the author reviews recent investigations on the specialization of parasitism among the powdery mildews and gives the results of his investigations with *Erysiphe graminis*, confining himself to forms of the fungus occurring on wheat and barley. In all morphological characters the form occurring on the wheat is indistinguishable from that occurring on the barley, but inoculation experiments showed distinctive physiological differences.

Inoculation experiments with the conidia of forms of *E. graminis* occurring on a number of species of Bromus are reported, 1,650 inoculations having been made. The results of the experiments show that a considerable number of the biological forms exist within the genus Bromus, the fungus occurring on *B. interruptus*, *B. "hordeaceus," B. commutatus*, etc., proving in each case to be a biological form possessing distinct infective powers.

In addition to the high degree of specialization in the fungus it is also shown that each species of Bromus has distinct physiological characters which exist along with the specific morphological characters, and as a rule each species of Bromus possesses characters which hold good for all examples of that species, no difference from what source they are derived. A few species were found which indicate a complication in the biological forms of the host plants.

Investigations with the morphological species *B. mollis* show that there are at least two distinct races of this species.

In addition to biological forms of the fungus there were found to be certain species of host plants which serve as "bridging" species. These seem to act as intermediate hosts between other species, and inoculations from these give successful infections on species otherwise resistant.

In the second paper the author records the results of inoculation experiments carried on with conidia of *Erysiphe graminis* from a number of species of grasses, of *Sphærotheca humuli* on a number of host plants, and of *E. cichoracearum*, etc. The result obtained showed that in every case the fungus studied had been specialized into biological forms.

The parasitism of some species of Basidiomycetes, GALZIN (*Bul. Assoc. Vosgienne Hist. Nat., 1904, No. 6, pp. 81–87; abs. in Bot. Centbl., 96 (1904), No. 51, p. 644*).—The author describes the alterations produced in timbers by the occurrence of *Pleurotus ostreatus, Claudopus variabilis, Dædalea unicolor, Polyporus adustus, P. versicolor, P. connatus, Irpex paradoxus,* and *Stereum cristulatum.*

The resistance of certain fungi to drying, MME. Z. GATIN-GRUZEWSKA (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 24, pp. 1040–1042*).—The author gives the results of experiments with a number of species of Polyporus, Amanita, and other fleshy fungi, in which their resistance to drying is shown. The fleshy bodies of the fungi were exposed to a temperature of 37° C. for from 8 to 10 days, after which the fungi were moistened and their vitality, as represented by the liberation of carbon dioxid, was determined. In many instances the fungi respired more than 50 per cent as much carbon dioxid in 1 hour as was given off by the same bodies before drying.

Diseases of economic tropical plants, F. NOACK (*Ztschr. Pflanzenkrank., 14* (*1904*), *No. 5, pp. 266–281*).—Compiled descriptive notes are given on a number of the more common diseases to which economic plants are subject in the Tropics. The information is largely drawn from publications issued in Brazil, Portugal, France, Java, and Germany. After treating of frost injuries in general, the author briefly summarizes the fungi and some of the more injurious insects attacking coffee, cacao, citrus fruits, guavas, olives, cotton, tobacco, bananas, vanilla, sugar cane, sorghum, etc.

Preliminary experiments with vapor treatments for the prevention of the stinking smut of wheat, W. A. WHEELER (*South Dakota Sta. Bul. 89, pp. 19, fig. 1*).—On account of the unsatisfactory nature of the treatments hitherto recommended for the prevention of smut, the author has investigated the possibility of treating seed grain with various gases and vapors, and in the experiments reported ammonia, formaldehyde, chloroform, carbon bisulphid, and Ozonet Gas Powder were tested. A form of apparatus was devised which consisted of a hand blower, a cylinder containing the grain, a vessel containing the fungicide, and tubes for the proper connection. By means of the blower the fungicide was vaporized and passed through the seed grain. The experiments were performed with seed wheat from the crop of 1903, which was very badly infected with smut.

The results of different lengths of treatment are summarized, from which it appears that when properly treated the amount of disease in the subsequent crop may be greatly reduced or, in the case of some of the experiments with formaldehyde vapor, entirely eliminated. The results with the other treatments were less satisfactory.

The effect of this treatment on the germination of wheat was investigated, and the subjection of the grain to vapors of the fungicide for from 10 minutes to 1 hour was without injury to the seed.

Inoculation experiments with ergots, R. STÄGER (*Bot. Ztg., 1. Abt., 61* (*1903*), *No. 6–7, pp. 111–158; abs. in Ztschr. Pflanzenkrank., 14* (*1904*), *No. 6, pp. 354–356*).—A list is given of the reputed host plants of the different species of Claviceps and summaries are presented showing the results of inoculation experiments with *C. purpurea* from rye, *Anthoxanthum odoratum, Glyceria fluitans,* perennial rye grass, and *Brachypodium sylvaticum,* and of *C. microcephala* from *Molinia cœrulea, Phragmites communis,* etc. A large number of inoculations made showed that there was a specialization of the fungi to special hosts or at least to species which are of rather close morphological relationship. They also indicated the existence of biological races among some of the species of grasses.

Some nematode diseases of cereals, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr., 13* (*1903*), *Nos. 1–2, pp. 34–66, figs. 4; 4, pp. 179–196, figs. 8; abs. in Bot. Centbl., 96* (*1904*), *No. 49, pp. 593–595*).—Descriptions are given of diseases of cereals

due to the nematode *Heterodera schachtii*. The author reports this nematode as attacking oats, winter and spring wheat, barley, rye, maize, and to some extent the different rye grasses, timothy, and orchard grass. He was unable to recognize it in brome grasses, vetches, peas, horse beans, white mustard, buckwheat, or spurry.

Various means for combating nematodes are discussed, and the use of large applications of Chile saltpeter is recommended.

The æcidium of maize rust, J. C. ARTHUR (*Bot. Gaz., 38 (1904), No. 1, pp. 64–67*).—An account is given of the discovery of the æcidial form of the common rust of corn, *Puccinia sorghi*. The author noticed the common infection of a species of Oxalis and the plants seemed to be in close association with a mass of débris made up largely of broken cornstalks. The affected plants of Oxalis were not found beyond the deposit of cornstalks, and acting upon this hint the author suspended over a potted plant of corn a number of rusted leaves of Oxalis and in a few days the characteristic appearance of the maize rust was produced. It is therefore considered that the æcidium of *P. sorghi* occurs on Oxalis, and a verification with teleutosporic material will be undertaken.

The author notes a few references to literature giving an account of the occurrence of æcidia on Oxalis and he thinks there is little doubt but that in every case it is to be associated with the maize rust.

The water relation of Puccinia asparagi, R. E. SMITH (*Bot. Gaz., 38 (1904), No. 1, pp. 19–43, figs. 21*).—The author presents an elaboration of certain features of investigations on the asparagus rust previously noted (E. S. R., 16, p. 66), giving a detailed discussion of the water relation of the fungus causing the disease. He summarizes his investigations, showing that there is a direct relation between the effect of moisture and the germination and development of spores and mycelium of the rust. This relation is of greatest importance when absolute conditions for control prevail. Dew is an absolute necessity in infection by rust and is more important in the development of the parasite than rain. Without moisture of this kind it appears that no infection can take place, although all the other conditions may be favorable. Atmospheric dryness not only limits spore germination, but retards the æcidial development of the fungus as well as the growth of the mycelium. If moisture conditions subsequently occur, spores are produced, otherwise the mycelium finally dies. The uredo development of the fungus is similarly checked, changing to a production of teleutospores without regard to season or condition of the host. The teleuto stage of the fungus is independent of food supply, moisture, temperature, or season. In most sections of the country extremes of moisture conditions are insufficient to bring out the points above enumerated.

In addition to the direct relation of moisture, there are important indirect relations which pertain mostly to soil moisture. An abundance of soil moisture during the summer has a marked effect in retarding the development of the fungus by giving the host greater vitality and resistance. This is shown by the varying summer rainfall in different seasons, by the differences in water-retaining capacity of different soils, and the effect of irrigation on the occurrence of the disease.

A study of Cystopus candidus, A. EBERHARDT (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), Nos. 6–8, pp. 235–245; 11–16, pp. 426–439; 19–21, pp. 614–631; 22–24, pp. 714–725, pl. 1*).—The author presents an elaborate report of investigations on the morphological and histological changes in the host plants as well as the results of investigations on the specialization of the mildew of cruciferous plants, *Cystopus candidus*. The changes in the host plants caused by the fungus are described at considerable length, comparisons being made as far as possible with those produced by the downy mildew (*Peronospora parasitica*). A large range of host plants was studied, and among the phenomena noted as caused by the fungus are the hypertrophy of all the tissues attacked, the swellings occurring on all parts of the plant except the roots and rarely on the ovules, the atrophy of ovules and pollen, the formation of

short branches, the violet coloration of normally green tissues, the abnormal formation of chlorophyll in tissues not usually containing it, the formation of starch in abnormal quantities and in unusual tissues, the increase of cell division, the modification of tissues, reversion of flower parts, etc.

A large number of inoculation experiments were performed to discover the phenomena of specialization, the conidia of the fungus being reciprocally transferred from host to host, various methods being employed. Attempts were made to introduce *C. tragopogonis* from salsify, but negative results were obtained with cruciferous plants, although *Scorzonera hispanica* was successfully inoculated. Successful experiments were made in which the disease was caused on several species of plants with oospores from *Lepidium sativum*.

The inoculation experiments with cruciferous host plants, while giving many negative results, are held to show the existence of a single species of fungus and to probably indicate the differentiation of at least 2 biological groups of cruciferous plants, one containing the species of Capsella, Lepidium, and Arabis, the other Brassica, Sinapis, and probably Diplotaxis.

The downy mildew of cucurbits in Hungary, G. LINHART (*Ztschr. Pflanzenkrank., 14 (1904), No. 3, pp. 143–145*).—The occurrence of the downy mildew of melons, cucumbers, and other cucurbits in Hungary is noted. In some regions as high as 80 per cent of all cucurbits were destroyed by this fungus. For its prevention the author recommends thorough spraying with 1 to 1½ per cent solutions of Bordeaux mixture.

Attention is called to a note by Rostowzew in which it is claimed that the fungus is not a true Peronospora and the name *Pseudoperonospora cubensis* is proposed for it.

Monilia diseases of fruit trees, J. RITZEMA BOS (*Tijdschr. Plantenziekten, 9 (1903), pp. 125–146, pls. 3, figs. 10*).—Descriptions are given of the brown rots of fruits due to *Monilia* spp. The usual form of fungus occurring on apples, pears, and other pomaceous fruits is said to be *M. fructigena*, while that naturally parasitic on cherries, plums, peaches, and stone fruits is *M. cinerea*. The author discusses the possible relationship between these two species and shows that many intergrading forms can be found and cross inoculations made under artificial conditions. Under natural conditions the differences seem sufficient to separate the parasites as distinct forms or races of fungi.

Investigations concerning olive bacteriosis, R. SCHIFF (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 6–8, pp. 217, 218*).—A preliminary report is given on some bacteriological investigations on *Bacillus oleæ*, the cause of the disease of olives known as bacteriosis. The organism is said to be a polymorphous one, forming in the tissues of the host short, rounded bacteria, but when cultivated upon artificial media it exhibits a number of modified forms. Some of the special modifications due to the substratum on which the organism is grown are described, and notes are given on the action of the bacillus on the cell centents and tissues of the host plant.

A disease of the olive tree, U. BRIZI (*Separate from Bol. Uffic. Min. Agr., Ind. e Com. [Rome], 1903, pp. 40, pls. 5; abs. in Bot. Centbl., 96 (1904), No. 51, p. 643*).—A description is given of a disease of the olive tree known as "brusca" which is attributed to the fungus *Stictis panizzei*. The history and characteristics of the disease, its effects and conditions of development, together with a botanical study of the fungus, are given.

Two new diseases of figs, R. FARNETI (*Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1904), pp. 513–517*).—Notes are given on two new diseases of figs caused by attacks of *Alternaria fici*, n. sp., and *Cladosporium sicophilum*, n. sp. The fruits are the portions attacked, and considerable injury is reported as following the appearance of the disease. Technical descriptions are given of both fungi.

A gum disease of grapes, L. MANGIN and P. VIALA (*Rev. Vit., 23 (1905), No. 577, pp. 5, 6, pl. 1*).—A description is given of the formation of gum on grapes, which so

far does not seem to be associated with any particular fungus disease. The masses of gum appear on the fruit and are attributed to a disorganization of the tissues of the fruit, resulting in the formation of pectose and pectate of lime, or the grapes are charged with gum which presents itself and can not be attributed to the pathogenic action of any foreign organism. The trouble seems to have been very local and is not believed to constitute a destructive disease.

The red rust of tea, H. H. MANN and C. M. HUTCHINSON (*Indian Tea Assoc. [Pamphlet] 4, 1904, pp. 26, pls. 7*).—In continuation of previous notes on the subject (E. S. R., 15, p. 277) the authors give an extended account of the red blight or rust of the tea plant, which is attributed to the alga *Cephaleuros mycoidea*. The distribution of this disease throughout India is indicated and its effect upon the tea plant described.

The spores are carried about and distributed similarly to those of fungi, and finding suitable lodgment they produce the characteristic red rust patches on the stems in April, May, and June following infection in the previous rainy season.

The alga grows on a number of trees besides tea, and it is said to be almost hopeless to attempt to keep it out of the tea plantations. Anything that interferes with the rapid, strong growth of the tea plants makes it subject to attack of the rust, and the authors discuss the value of cultivation, enriching of soil, resistance of varieties, methods of pruning, etc., as means for preventing loss. Where pruning is resorted to it is suggested that thorough spraying with Bordeaux mixture should follow the pruning and that all the diseased material cut off should be burned.

Some fungus parasites of coffee, G. DELACROIX (*Bul. Soc. Mycol. France, 20 (1904), pp. 142–151, pl. 1; abs. in Bot. Centbl., 96 (1904), No. 47, p. 553*).—Descriptions are given of *Capnodium coffeæ*, *Anthostomella coffeæ*, *Hendersonia coffeæ*, *Rhabdospora coffeicola*, *Phyllosticta coffeicola*, and *P. comœnsis*, all of which are reported as occurring on coffee trees in Mexico.

A new and destructive disease of oaks, W. RUHLAND (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 6–8, pp. 250–253; abs. in Bot. Centbl., 98 (1905), No. 1, pp. 15, 16*).—A preliminary report is given of a disease of oaks which was first noticed in Mecklenburg during the spring of 1904. The cause of the disease is said to be *Dothidea noxia*, n. sp., which attacks the branches and twigs of the trees, particularly occurring on young trees. The conidial phase of the fungus is attributed to *Fusicoccum noxium*. Technical descriptions of both phases of the fungus are given. It occurs on the living cortex of oaks, but not on beech or chestnut.

An important disease of lindens, R. LAUBERT (*Ztschr. Pflanzenkrank., 14 (1904), No. 5, pp. 257–262, pl. 1*).—A leaf spot disease of linden trees which appears to have been hitherto imperfectly known is described. It is reported as occurring in various parts of Germany and also in Denmark, and is attributed to the fungus *Glœosporium tiliæ*. The leaves are attacked in May or sometimes later in the year, the fungus causing irregular discolored areas in which the tissues soon die. The microscopic characters of the fungus are described in considerable detail, after which a discussion is given of its possible relationship with a number of other species of fungi occurring on the linden.

The author recommends cutting out the diseased leaves and twigs wherever possible and spraying with a 1–2 per cent solution of Bordeaux mixture, the application to be made early in the season before or during the opening of the leaf buds.

Lenzites abietina on fir, GALZIN (*Bul. Assoc. Vosgienne Hist. Nat., 1904, No. 6, pp. 89–91; abs. in Bot. Centbl., 96 (1904), No. 51, p. 644*).—This fungus, which is said to be rare in the forest, attacks fir timber, penetrating it and injuring it to a considerable extent. The changes produced resemble those caused by the dry rot fungus to some extent and the two are said to be frequently confused. The author claims that wood which has been subjected to copper sulphate treatment is not attacked by this fungus.

Notes on species of fungi cultivated from rhododendron leaves, P. HENNINGS (*Ztschr. Pflanzenkrank., 14 (1904), No. 3, pp. 140–143*).—A brief account together with technical descriptions is given of the fungi isolated by the author from leaves of *Rhododendron falconeri*, a Himalayan species which was brought to the Berlin Botanical Garden in 1883. The species of fungi noted are *Leptosphæria rhododendri*, *Pleospora falconeri*, *Phacidium falconeri*, *Phyllosticta berolinensis*, *P. falconeri*, *Macrophoma falconeri*, and *Coniothyrium rhododendri*.

A new parasite of orchids, L. MONTEMARTINI (*Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1904), pp. 99–101, pl. 1*).—A technical description is given of *Uredo aurantiaca*, n. sp., which has been recently observed as occurring on the leaves of *Oncidium cavendishianum*.

A chemical-physiological method of determining the presence of copper in dilute solutions, EWERT (*Ztschr. Pflanzenkrank., 14 (1904,) No. 3, pp. 133–136*).—A method of testing for copper in extremely dilute solutions is given which is based upon the inhibiting action of copper to diastase. The author claims the method is accurate for testing solutions as dilute as 1 part of copper sulphate to 30,000,000 parts of water. The test is made by adding a drop of the copper solution to 2 drops of a diastase solution and 10 drops of a starch solution, and after standing for about an hour and a half at room temperature 2 drops of an iodin solution are added to the tubes, and comparisons made with similar tubes in which the copper solution is omitted. The copper-containing solutions at once become blue from the characteristic starch reaction, while the checks are either colorless or reddish.

The author claims that Bordeaux mixture when too strongly made checks the metabolism of starch in the leaves, the retardation being in proportion to the strength of the solution. The green parts of all plants contain diastases and the presence of the copper has an inhibiting effect on the activity of the enzym.

ENTOMOLOGY.

Fourth report of the State entomologist, W. E. BRITTON (*Connecticut State Sta. Rpt. 1904, pt. 3, pp. 199–310 + X, pls. 18, figs. 17*).—A list is presented of insects sent to the station during the year for identification. Brief notes are given on some of the more conspicuous entomological features of 1904. The potato beetle did not become abundant until late in the season. Numerous galls appeared on the leaves of honey locust, due to *Cecidomyia gleditchiæ*. The pear-tree psylla was successfully held in check by lime and sulphur sprays. Evidence was obtained that the fall webworm is double brooded in Connecticut. Notes are also given on onion maggot, cockroaches injurious to books, *Autographa biloba* on geranium leaves, strawberry root borer, apple leaf hopper, sawflies, tarnished plant bug, plum curculio injuring apples, etc. An account of experiments in controlling San José scale is given on pp. 221–252. This has been previously noted (E. S. R., 16, p. 578).

In a report on mosquito investigations the entomologist was assisted by H. L. Viereck. An investigation was undertaken to determine the species of mosquitoes found in the State, their chief breeding places, and effective means for controlling the pests. Notes are given on the agency of mosquitoes in carrying malaria and yellow fever. The life history and habits of mosquitoes are briefly noted. According to the report there are 22 species of mosquitoes in Connecticut. Descriptive and biological notes are given on these species, together with a key for their identification. Notes are presented on the breeding places of mosquitoes in various parts of Connecticut, as determined by a survey undertaken for this purpose. Salt marshes should be treated by draining by means of ditching, plows, or more elaborate machines. Experiments with copper sulphate showed that when used at the rate of 1 part to 60,000 in water it does not check the development of mosquitoes. Shrimps and pike were observed feeding upon mosquito larvæ. In the inland region of Con-

necticut the malarial mosquito and *Culex pipiens* are the most important species, and along the coast *C. sollicitans* and *C. cantator*. They breed in salt marshes and migrate inland for several miles.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 7 (1905), No. 1, pp. 64, figs. 11*).—A record is given of the meetings of the society from October 6 to December 1, 1904. At these meetings the following list of papers was presented: Arachnids from Cocos Island; an Alleged Parasitic Tyroglyphid, by N. Banks; Note on *Thaumatoglossa americana*, by H. S. Barber; On the Species of Sphenophorus Related to Pertinax, with Descriptions of Other Forms, F. H. Chittenden; Dragon Flies from the Kootenay District of British Columbia, R. P. Currie; Our Present Knowledge of North American Corethrid Larvæ; New North American Lepidoptera and Synonymical Notes; Remarks on Genitalic Genera in the Culicidæ, by H. G. Dyar; Description of a New Anasa from North America, by O. Heidemann; The Historical Method in Type Fixation, by G. W. Kirkaldy; The Insect-Catching Grass of Cuba, by E. A. Schwarz.

The insect-catching grass referred to in the last-named paper is *Cenchrus echinatus*, and it appears that insects are captured by this grass as a result of flying against the minutely barbed spines. A considerable variety of insects was found attached to the heads of the grass, some of the species captured being strong fliers.

The entomological section, C. B. SIMPSON (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 322–335, pl. 1*).—*Papilio demoleus* is a well-known pest of citrus trees in the Transvaal. In combating the pest spraying with Paris green and other arsenicals and hand picking of the larvæ are recommended. Notes are given on the habits and life history of the Deathshead moth, Oleander sphinx, and *Angelica tyrrhea*. Locusts are reported as occurring in threatening numbers. The use of a poison bait containing arsenic, soda, sugar, and water has given the best results in controlling locusts. The use of screens has also been quite successful. The author discusses the regulations adopted in Transvaal for the control of nurseries and the prevention of the importation of insect pests along with nursery stock.

Entomological memoirs, J. H. FABRE (*Souvenirs Entomologiques. Paris: Ch. Delagrave, 1900–1903, 7. ser., pp. 395, figs. 20; 8. ser., pp. 379, figs. 13*).—These volumes contain a detailed record of observations made by the author regarding the habits and instincts of insects. A large number of species belonging to various families are discussed. Among these there are many of agricultural importance, such as the pea and bean weevil, plant bugs, plant lice, snout beetles, etc.

Economic entomology, E. R. SAWER (*Rhodesian Agr. Jour., 2 (1904), No. 2, pp. 67, 68*).—Brief notes on the habits, life history, and means of combating grain moth, granary weevil, rice weevil, Indian-meal moth, and flour beetles. In destroying these pests the use of bisulphid of carbon is recommended.

New Zealand Neuroptera, G. V. HUDSON (*London: West, Newman & Co., 1904, pp. X+102, pls. 11*).—A classification of the Neuroptera is presented. This order, as treated by the author, includes bird lice, white ants, stone flies, dragon flies, May flies, ant lions, lacewing flies, caddice flies, etc. Descriptive, economic, and biological notes are given on various species of these suborders.

The lepidopterous fauna of the Balkan countries, H. REBEL (*Ann. K. K. Naturhist. Hofmus. [Vienna], 18 (1903), No. 2–3, pp. 123–347, pl. 1*).—Descriptions are given, together with notes on the occurrence and distribution of a large number of lepidopterous species. The literature relating to this subject is also discussed.

Some breeding experiments on Catopsilia pyranthe and notes on the migration of butterflies in Ceylon, N. MANDERS (*Trans. Ent. Soc. London, IV, 1904, pp. 701–708, pls. 2*).—*Catopsilia pyranthe* and related forms occur quite abundantly in the vicinity of Colombo, where the lowest temperature ever recorded is 68° F. Experiments were carried out for the purpose of determining the effect of low and high temperatures and different degrees of moisture upon the development

of these butterflies. When the pupæ were kept in an abnormally hot and dry atmosphere they all died. Similarly no success was had in rearing larvæ when kept at a temperature of 80° F. in an atmosphere saturated with moisture. Preliminary experiments were carried out in keeping pupæ at temperatures of 55 and 65° F. by means of ice. The results of these experiments are not yet apparent.

The control of the boll weevil, including results of recent investigations, W. D. Hunter (*U. S. Dept. Agr., Farmers' Bul. 216, pp. 32, figs. 5*).—This bulletin was prepared to replace Farmers' Bulletin No. 189 already noted (E. S. R., 15, p. 879). It contains a restatement of the previous recommendations of the Bureau of Entomology regarding the means of controlling the boll weevil, together with an account of more recent work which has substantiated those recommendations, an account of a variety test of cotton, the present territory infested by the boll weevil, and State quarantine laws against the importation of the boll weevil. Such laws now exist in Alabama, Georgia, Louisiana, Mississippi, North and South Carolina, and Oklahoma. Suggestions are made regarding the desirability of the uniform State law for the control of the boll weevil. Observations were made on the Mexican tree cotton, during which it was found that this species was not immune to weevil attacks.

The cotton boll weevil, W. W. Froggatt (*Agr. Gaz. New South Wales, 16 (1905), No. 1, pp. 23–25, figs. 2*).—Notes are given on the habits, life history, and injurious attacks of this species. The possibility of its being introduced into Australia is suggested.

The method of rearing the natural enemy of the cotton boll weevil on a large scale, A. L. Herrera (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 19 (1904), No. 11–12, pp. 327–331*).—A mite resembling the chicken mite was discovered infesting the Mexican cotton boll weevil. Experiments were made in devising a suitable semifluid nutrient media in which this mite could be artificially reared in large numbers and scattered upon infested cotton plants. Considerable success has been had along this line.

The Hessian fly (*Bd. Agr. and Fisheries [London], Leaflet 125, pp. 3, figs. 7*).—This insect is described and notes are given on its food plants, life history, and treatment. It is recommended that screenings be burned or utilized so as to prevent the development of the flaxseed stage of the Hessian fly. The use of fertilizers may also stimulate the crop so as to enable it to endure the attacks of the Hessian fly more successfully. Winter wheat should be sown late, so as to avoid the autumn attack of the pest.

The fruit fly (Ceratitis capitata), C. W. Mally (*Agr. Jour. Cape Good Hope, 25 (1904), No. 6, pp. 647–662, pl. 1, fig. 1*).—This pest is most injurious to peaches and apricots. It was apparently brought to Cape Colony from Madeira. Detailed notes are given on the habits, life history, and food plants of the insect, together with a description of the pest in its various stages. A large number of natural enemies of this insect have been observed, including birds, spiders, wasps, and internal parasites. In controlling the pest, the collection and destruction of fallen fruit, at least once daily, are recommended, together with thorough cultivation of the soil, clean picking of the fruit, and the use of nets to prevent the insects from depositing their eggs in the fruit. The use of poisoned bait was tested and encouraging results were obtained. This method will be further tested for the purpose of determining its practical efficiency. It is believed that there is little hope of efficient aid from the natural enemies of the pest.

The greenhouse white fly, A. W. Morrill (*U. S. Dept. Agr., Bureau of Entomology Circ. 57, pp. 9, fig. 1*).—The damage caused by this insect is outlined, together with notes on its origin, distribution, food plants, and appearance in various stages. It may usually be readily distinguished from *Aleyrodes citri* and *A. packardi*. The remedy recommended as most efficient in destroying this pest is fumigation with

hydrocyanic-acid gas. In the ordinary greenhouse 7 mg. of potassium cyanid is sufficient for each cubic foot of space. It is recommended that fumigation be done at night, when the foliage is dry. If it is undesirable to use hydrocyanic-acid gas the greenhouses may be fumigated with tobacco, or whale-oil soap may be applied at the rate of 1 to 1½ oz. to a gallon of water.

Monograph of Aphis ribis, J. H. L. Tlögel (*Allg. Ztschr. Ent., 9 (1904), Nos. 17-18, pp. 321-334; 19-20, pp. 375-382, figs. 9*).—An elaborate discussion is presented of the microscopic appearance of the egg, embryo, and various stages of growth of this pest. The alternation of generations is discussed with especial mention of host plants.

The destruction of the eggs of phylloxera in winter by means of lysol, G. Cantin (*Compt. Rend. Acad. Sci.* [*Paris*], *139* (*1904*), *No. 26*, *pp. 1232, 1233*).—The author has tested the value of this method for 4 seasons and finds that lysol thus applied is capable of keeping vineyards entirely free from phylloxera. The roots of a number of vines were examined without finding a single tubercle on any of them.

A life history of Cimbex fagi, A. J. Van Rossum (*Tijdschr. Ent.*, *47* (*1904*), *Nos. 2-4*, *pp. 69-98*, *pls. 3*).—This insect is described in its various stages with especial reference to the parasites which have been found to hold it in check. A brief account is also given of breeding experiments with the insect and of parthenogenesis as observed in the species.

Monograph of the white ants of Africa, Y. Sjöstedt (*K. Svenska Vetensk. Akad. Handl.*, *38* (*1904*), *No. 4*, *Sup.*, *pp. 128*, *pls. 4*).—Since the publication of the author's monograph on this subject in 1900 much new material has been collected which necessitated the publication of a supplement. Analytical tables are given as aids in the determination of species, and descriptive, economic, and biological notes are presented on the various species described.

Insects injurious to pecans, G. W. Herrick (*Mississippi Sta. Bul. 86*, *pp. 42*, *figs. 24*).—The author has devoted considerable time to a study of the insect pests of this nut and presents a preliminary report in the bulletin. The pecan pruner (*Oncideres texana*) injures young pecans in nurseries by cutting into the twigs and depositing eggs. The injury to the twigs is done before the eggs are laid. This beetle is generally distributed throughout the southern States and feeds upon oak, hickory, and persimmons in addition to the pecan. In controlling the pest it is recommended that severed and infested branches be cut and burned in the autumn. The pecan borer (*Sesia scitula*) is described in all its stages with notes on its life history. This insect confines its injuries to the trunk and branches above ground. It causes great damage to young and old trees and frequently injures newly set buds. In preventing the attacks of this pest it is recommended that care be exercised to avoid injuring the bark of nursery trees, since the insect may enter into such wounds. The borers may be dug out of infested branches in small nurseries. Various leaf-eating caterpillars cause great injury to pecans and a number of them are discussed in the bulletin. Among these mention may be made of *Catocala viduata*, *Datana angusii*, and *D. integerrima*. These pests may be combated by spraying with arsenical poisons, or the last two species may be readily destroyed in the caterpillar stage on account of the habit of collecting in masses on the trunks of trees during the molting periods. Descriptive, biological, and economic notes are also given on fall webworm, *Mallodon melanopus*, white ants, oak pruner, pecan weevil, and pecan budworm. The work of the white ants on pecans appears to be confined to the seedling trees of the first year's growth, but these insects may also attack older trees. In order to combat this pest it is necessary to destroy the whole nest either by hot water or carbon bisulphid. The pecan weevil may be controlled by heating infested nuts to a temperature of 125 to 150° F. or by fumigating such nuts with carbon bisulphid.

A note on the preservation of bamboos from the attacks of the bamboo beetle or "shot borer," E. P. Stebbing (*Calcutta: Supt. Govt. Printing, India, 1903, pp. 16*).—The "shot borer" is described, together with notes on its distribution, habits, and injurious attacks upon bamboos. Experiments were tried in protecting bamboos against the attack of this pest by soaking them in a solution of copper sulphate for 5 days or in Rangoon oil for 24 hours. As a result of these experiments it was found that soaking bamboos for 5 days in water, followed by a similar treatment for 5 days in a solution of copper sulphate, furnished no protection against the beetles. When bamboos were treated in an oil tank, however, they were protected against subsequent attack.

A note on the Casuarina insect pests of Madras, E. P. Stebbing (*Calcutta: Supt. Govt. Printing, India, 1903, pp. 20*).—Considerable insect injury has been reported in Casuarina plantations along the eastern coast of Madras. A number of these pests were identified, and notes are given on their life history and on means of combating them. One of the most injurious species is *Arbela tetraonis*. The injury is done by the caterpillar, which feeds upon the bark of infested trees. During the period when the larvæ are thus feeding upon the bark they may be readily detected and destroyed by hand picking or by a kerosene emulsion. Various other pests are described and suggestions given regarding their control.

A note on the sandalwood boring insects of Madras, E. P. Stebbing (*Calcutta: Supt. Govt. Printing, India, 1903, pp. 13*).—Sandalwood is considerably injured by borers, the most important of which appears to be *Zeuzera coffeæ*. A detailed account is presented of the life history and injurious habits of a species of Stromatium, the larvæ of which live in the main stem or side branches of sandalwood trees. Infested wood is greatly injured by this pest. Notes are also given on a number of other species, including a wood wasp.

The banded pine weevil and the brown pine weevil (*Jour. Bd. Agr.* [*London*], *11* (*1905*), *No. 11, pp. 686–693, figs. 8*).—*Pissodes notatus* is injurious in the adult and larval stages. The insect is described and notes are given on its life history. The beetles may be collected in nurseries and may also be captured in considerable numbers by the use of trap trees. *Hylobius abietis* is reported as a very serious pest. It attacks pine, spruce, larch, and fir. In controlling this insect it is recommended that stumps and roots be removed from cleared areas after having been left sufficiently long to serve as places for egg laying. One of the most successful means of trapping the beetles consists in laying pieces of fresh Scotch-pine bark on the ground in newly cleared and infested areas. The beetles collect under these pieces of bark to feed.

On the acquisition of alar appendages of the spruce form of Chermes abietis piceæ in the northwest Himalayas, E. P. Stebbing (*Jour. Asiatic Soc. Bengal, 72* (*1903*), *II, No. 2, pp. 57–60*).—The life history of this insect is described in some detail with especial reference to the changes which occur at the molting periods. During the last molting the species undergoes a great change, losing its brilliant coloring and becoming inconspicuous. It differs from the winged form, which occurs simultaneously at this period, in showing a greenish tinge.

A first note on the life history of Chermes abietis piceæ, E. P. Stebbing (*Jour. Asiatic Soc. Bengal, 72* (*1903*), *II, No. 4, pp. 229–235*).—This insect was studied on spruce at various elevations between 8,000 and 9,500 ft. The forms of the pest which occur on silver fir are also noted and described in detail.

The new K-L mixtures and San José scale, C. P. Close (*Delaware Sta. Bul. 68, pp. 23*).—K-L is an abbreviation used to designate a mixture of kerosene, hydrated lime, and water. At first a proprietary form of lime known as limoid was used, but later other forms were found to be about equally effective. The mixture requires agitation for about 5 minutes when dry slaked or air slaked is used, while only 3 minutes' time is required when the limoid is used. No chemical action takes place between

the kerosene and lime. In general 1 lb. of lime will absorb 1 qt. of kerosene, and the K-L mixture should be made in that proportion. The mixture is then diluted with water to make the required strength. For a 15 per cent mixture, 7½ gal. of kerosene, 30 lbs. of lime, and 41½ gal. of water are required to make 50 gal. of the mixture. Where it is desirable to avoid the whitewashed appearance of the small bushes, lampblack may be added at the rate of 1 oz. to 10 lbs. of the lime. The K-L mixture may be further combined with Bordeaux mixture or copper sulphate, to which, if desirable, some arsenical poison may be added.

Experiments were made in testing the value of adding adhesives to the K-L mixture. Rosin soap, Bordeaux mixture, and copper sulphate were used for this purpose with satisfactory results. Copper sulphate is perhaps the best adhesive for use with the K-L mixtures. For summer spraying it appears to be safe to apply a 10 per cent K-L mixture with or without adhesives to apple, pear, peach, plum, and cherry trees. A slight injury to the foliage may follow when 12½ or 15 per cent solutions are used, but the injury is so small that it can be disregarded in view of the increased efficiency of the mixture. During the dormant season a 25 per cent mixture may be used. The K-L mixture when compared with lime-sulphur-salt wash proved to be about equally efficient, but did not adhere quite so well. The chief advantages of the K-L mixture are that it may be prepared without the use of heat at a moderate cost and without the development of unpleasant odors. The spray spreads readily on the bark of treated trees.

Sulphur washes for orchard treatment, II, P. J. Parrott, S. A. Beach, and F. A. Sirrine (*New York State Sta. Bul. 262, pp. 37–68, pls. 4*).—Experiments were carried out to ascertain the applicability of sulphur washes as combined insecticides and fungicides and to determine the extent to which they may replace Bordeaux arsenical mixtures. The experiments were conducted in a number of orchards involving apple, peach, pear, and plum trees. The orchards were divided into 4 sections, one of which was sprayed once with the sulphur wash, a second 3 times with a sulphur wash (once before the opening of the buds and twice after the fall of the blossoms), the third 3 times at similar intervals with Bordeaux arsenical mixture, while the fourth was left unsprayed. The lime-sulphur wash contained 15 lbs. each of lime and sulphur per 50 gal. of water. The lime-sulphur-caustic-soda wash was also used, containing 30 lbs. lime, 15 lbs. sulphur, and 6 lbs. caustic soda per 50 gal. of water. On peaches sulphur wash proved very efficient in destroying the San José scale and checking leaf curl. The trees were not injured except in the case of a few Elbertas which were well advanced in growth at the time of spraying (April 14 to 16). On pear trees the blister mite was almost entirely eradicated and the trees were unaffected. The application of Bordeaux arsenical mixtures to apple trees appeared to be more effective in controlling the codling moth than the sulphur wash alone. The use of the sulphur wash was very effective in the control of apple scab. Apple aphis was not sufficiently abundant to permit a conclusion as to the effectiveness of the remedies used. The sulphur wash gave satisfactory results in treating trees for the scurfy bark louse, and the lime-sulphur-caustic-soda wash was effective in destroying *Chionaspis corni* on dogwood trees. A comparison was made of the value and effectiveness of different forms of sulphur washes. Preference is given by the authors to the boiled lime-sulphur wash. Where conveniences for applying heat were not at hand, however, the self-boiled lime-sulphur-caustic-soda wash was recommended. One application of the sulphur wash reduced apple scab 22 per cent. The combined treatment, consisting of one application of sulphur wash before the buds opened and 2 treatments of Bordeaux arsenical mixtures after flowering, reduced the apple scab 73 per cent and the codling moth 27 per cent.

Sulphur sprays for orchard trees, II, F. H. Hall et al. (*New York State Sta. Bul. 262, popular ed., pp. 10, figs. 2*).—A popular edition of Bulletin 262 of this station noted above.

Examination of Paris green and other arsenicals used in spraying, G. E. Colby (*California Sta. Rpt. 1904, pp. 44–47*).—A number of samples of Paris green were analyzed, and as a result of these tests it was found that Paris green, now offered for sale in the California markets, is much better than in former years and shows comparatively small percentages of arsenious oxid soluble in water. The total arsenious oxid shown in samples varied from 53.2 to 60.8 per cent.

An official organization for controlling the enemies of plants, E. Taulis (*An. Asoc. Antiguos Alumnos Inst. Agr. Chile, 3 (1904), pp. 101–107, pls. 4*).—An outline is presented of the official organization necessary for carrying out insecticide work in destroying injurious insects. Notes are presented on fumigation with hydrocyanic-acid gas and spraying with various kinds of apparatus.

Transvaal regulations to prevent introduction and spread of insect pests and diseases of plants (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 12, pp. 1127–1131*).—A copy is given of an ordinance regarding the inspection of nurseries and orchards and the control of the most serious insect and fungus pests. Particular mention is made in the law of the introduction of grapevines, coffee plants, eucalyptus, and stone fruits.

Anopheles claviger in winter and summer, G. Schneider (*Korbl. Naturforsch. Ver. Riga, 47 (1904), pp. 41–45*).—Attention is called to various points in the life history of this species which would distinguish it from other species of mosquitoes.

The structure of the honey cell, Bauer (*Verhandl. Naturw. Ver. Karlsruhe, 17 (1903–4), pp. 8*–11**).—Details are given regarding the differences in angles and construction of honey cells made by bumblebees, honeybees, species of Melipona, etc.

Annual report of the Royal Sericultural Station of Padua (*Ann. R. Staz. Bacol. Padova, 32 (1903), pp. 151, pl. 1, figs. 4*).—As in previous reports of this station, a general review is presented of the scientific and practical work carried on under the auspices of the station at Padua and in other parts of Italy. The greater portion of the report is occupied with accounts of the experimental work of the station. E. Verson discusses sericulture in Italy and methods of extending this industry (pp. 17–32). The status of silk raising in southern and central Italy is described and suggestions are made for government aid for the encouragement of the industry. E. Quajat discusses the subject of autumnal hibernation as interrupted by the temporary return of the high temperatures (pp. 33–42). It has been found that in order that the eggs may be successfully hatched in August and September it may be necessary to preserve them in cold storage for 45 to 60 days. In this way a premature hatching is prevented. Notes are given on the results obtained from the application of cold to silkworm eggs and on the action of the cold upon the eggs. The same author reports briefly on experiments in the artificial coloration of silk (pp. 43–50). White races of silkworms fed on material colored with a neutral red showed a red coloration of the silk organ, the posterior portion being rose red, the anterior part deeper red, and the muscles light red. The influence of Sudan III was seen in the production of a pale rose-red color. The eggs from caterpillars fed on food colored with methylene blue exhibited either a greenish or a normal color. Eggs from caterpillars fed on leaves colored with neutral red or Sudan showed a rose color. The author believes that his experiments are too limited to permit drawing general conclusions regarding the possibility of artificial coloration of silk. E. Verson presents an account of the regeneration of the thoracic feet of the silkworm (pp. 51–91). Detailed notes are given on the anatomical structure of these organs and the process of regeneration after the removal of one or more of the thoracic feet. A brief bibliography of the subject is appended to the article. The same author discusses the general subject of variations in color in the cocoons of Lepidoptera (pp. 92–96). This subject is discussed from the standpoint of protective coloration. The influence of external conditions upon the physical properties of cocoons is discussed by E. Bisson

(pp. 97–105). This paper deals with the effect of different kinds of food, different amounts, and different times of feeding upon the physical properties of silk. E. Verson presents a brief account of the use of corrosive sublimate and fluorid of silver in treating mulberry leaves for the prevention of infectious diseases of silkworms (pp. 106–109). The results obtained were not very encouraging. The same author discusses the external characters for judging the sex of silkworm larvæ (pp. 125–130). This subject is also considered by E. Quajat (pp. 110–124). An elaborate bibliography of works relating to sericulture published in 1903–4 is appended to the report.

FOODS—NUTRITION.

Experiments on the digestibility of cereal breakfast foods, W. O. ATWATER, H. C. SHERMAN, and R. D. MILNER (*Connecticut Storrs Sta. Rpt. 1904, pp. 180–209*).—Healthy young men were the subjects of experiments undertaken to study the digestibility of a number of commercial brands of cereal breakfast foods, which it is claimed are made largely from wheat. The diet consisted of the cereal breakfast food, milk, cream, and sugar, the digestibility of the cereal food alone being calculated from that of the entire ration in the usual way by the use of factors. The following table shows the average results obtained:

Coefficients of digestibility of nutrients and availability of energy of cereal breakfast foods.

Cereal food.	Protein.	Carbohydrates.	Energy.
	Per cent.	*Per cent.*	*Per cent.*
Grape-Nuts, average of 3 experiments	70.1	91.5	86.3
Malta Vita, average of 4 experiments	72.1	90.0	83.4
Force, average of 2 experiments	69.8	88.5	78.7

In discussing the experiments the results are compared with average values for the digestibility of wheat bread of different sorts. The conclusions reached were in effect as follows:

In these experiments the digestibility of the different brands of breakfast foods, all said to consist largely of wheat, was found to be smaller, especially in the case of the protein, than that of the nutrients of wheat flour. Two of the three different brands used in the experiments, though made at different factories, were quite similar in character, but the third was somewhat different from either The uniformity of the results is therefore the more interesting.

The total number of experiments, and the number of different brands included, is too small to warrant final conclusions from the results with respect to the digestibility of wheat breakfast foods in general. It is interesting to note, however, that the results here reported are in very close accord with those of other experiments with the same and different kinds of wheat breakfast foods made elsewhere but still awaiting publication.

The nutritive value of prepared cereal products, R. D. MILNER (*Connecticut Storrs Sta. Rpt. 1904, pp. 210–240*).—A popular summary of information regarding the origin and preparation of cereal breakfast foods, their nutritive value, composition, digestibility, methods of cooking, relative cost, and possibilities of adulteration and sophistication. Some of the general deductions follow:

"In general the prepared cereal products are all wholesome and nutritious, and when reasonable in price are economical sources of nutrients and energy, especially when compared with meats or green vegetables. The different preparations from the same grain resemble each other quite closely in actual nutritive value. A curious name or appearance or process of preparation does not indicate any extraordinary food value, and the intelligent buyer may make his choice largely in accordance with

taste, distrusting the extravagant claims made for any particular brand. If he considers economy, however, he is hardly justified in paying for some brands prices which are equivalent to 15 to 20 cts. a pound when other preparations of equal value may be had for 6 or 8 cts. a pound. . . . The nutritive value of the 'malted' or so-called 'predigested' preparations is no greater than that of other preparations from the same grains. . . . In most of the malted preparations the quantity of starch actually converted [into soluble material is] . . . very small, and in some cases none has been changed.

"The thoroughness of cooking has quite as much influence upon the actual food value of the preparations as the small differences in composition. If the cereals are not thoroughly cooked some of the nutritive material will escape the action of the digestive juices. The partially cooked cereals should always be further cooked for at least as long a time as directed, and even longer cooking will be advantageous in many cases."

Nutrition investigations, M. E. JAFFA (*California Sta. Rpt. 1904, pp. 53–70*).—The investigations summarized were made in cooperation with this Office and have been previously noted (E. S. R., 12, p. 677; 13, p. 974; 15, p. 492).

The grocers' manual, L. ARNOU (*Manuel de l'épicier. Paris: J. B. Baillière & Sons [1904], pp. 460, figs. 137; rev. in Mois Sci., 7 (1905), No. 1, pp. 15, 16*).—Foods, condiments, culinary products, fermented beverages, perfumes, fats, and other related topics are treated of, one of the special objects being to provide information useful in determining the quality of goods. An alphabetical index adds to the value of the volume.

Confectioner and liquor manufacturers' manual, L. ARNOU (*Manuel du confiseur-liquoriste. Paris: J. B. Baillière & Sons [1904], pp. 388, figs. 188; rev. in Mois Sci., 7 (1905), No. 1, p. 16*).—In this volume, which is designed as a practical handbook, the author treats of the manufacture of candies, bonbons, glacé fruits, sirups, liquors, aerated beverages, and similar goods.

Food and cookery in Jamaica, JULIA D. CHANDLER (*Boston Cooking-School Mag., 9 (1905), No. 7, pp. 348, 349, 372*).—A number of Jamaica food products are described, together with methods of cooking and serving them. Some data are also given regarding ways in which the local food supply is used in making up the daily diet.

South German cookery, KATHARINA PRATO, revised by VIKTORINE VON LEITMAIER (*Die süddeutsche Küche. Gratz: Verlagsbuchhandlung "Styria," 1904, pp. VIII+800, pls. 4, figs. 50, charts 8*).—In this, the thirty-sixth edition, the material, it is stated, has been carefully gone over and some new matter has been added. Directions are given for the preparation of all classes of food materials, and the volume as a whole constitutes an elaborate compendium of south German cookery.

The ration of laborers, A. SLOSSE (*Bul. Soc. Roy. Sci. Méd. et Nat. Bruxelles, 1903, Dec. 7; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 2, pp. 174–181*).—The results of an investigation of the diet of laborers' families in Belgium are reported. According to the author, the diet of the Belgian farmer contains 90.5 gm. protein, 103.1 gm. fat, and 547.7 gm. carbohydrates, the energy value being 3,575.5 calories, and that of a Belgian town laborer 75.7 gm. protein, 72.7 gm. fat, and 363.7 gm. carbohydrates, the energy value being 2,483.8 calories per day. The results are compared with those of other investigators.

Dietary of Ayr District Asylum patients, C. C. EASTERBROOK (*Ann. Rpt. Ayr Dist. Asylum, 33 (1902–3), pp. 19, 23, 55, 56*).—The existing dietary conditions of Ayr district asylum are described and diet tables of the institution given. It is stated that the dietary has been revised on a scientific basis so that it is suited to the requirements of the different patients, the basis selected being the amount of muscular work performed. The attempt is made to secure variety in the meals. "Diet books have been introduced into the wards, showing the requirements of the patients in each. Careful adjustment of the needs of the various groups of patients and of

individuals as to food, regulation of the food issued from the stores accordingly, preferential use of those food alternatives in the dietary which are cheaper for the time being, good and economical cookery in the kitchen, and finally, intelligent distribution, are all essential to the checking of waste in the dietary arrangements of a large institution."

The diet of Indo-Chinese when living in a cold climate, R. MOULINIER (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 27, pp. 210, 211*).—The author records data regarding the diet of a number of Anamites during the winter season on the Yangtze River, where the climate was quite cold. These subjects had formerly lived on the Tonkin delta, where the climate was very warm. It was noticed that during the cold weather their accustomed diet, consisting largely of rice, which is deficient in protein, did not suffice for their needs. The carbohydrates in the ration were diminished and the nitrogenous constituents increased, the ration adopted being biscuit 100 gm., rice 800 gm., meat (chicken, pork, etc.) 300 gm., fat 15 gm., and salt 10 gm., with some tea and condiments. On this diet, which the author calculates furnished 126.7 gm. protein and 3,600 calories, they remained in good health and were able to perform the required amount of muscular work. Especial emphasis is laid on the fact that a considerable amount of protein was required.

Methods followed in fixing upon dietary standards, A. GAUTIER (*Rev. Soc. Sci. Hyg. Aliment.*, *1* (*1904*), *No. 2, pp. 117–120*).—In a controversial article the author gives reasons for his belief that the average data regarding the food consumed by a large number of people are trustworthy, and in support of his contention he compares the average figures, which he has computed as representing the amounts consumed per man per day in Paris, with data which have been obtained with single individuals or with small groups.

A cause of error in calculating the energy value of dietaries, A. SLOSSE (*Rev. Soc. Sci. Hyg. Aliment.*, *1* (*1904*), *No. 2, pp. 121–125*).—The author discusses the sources of error in the determination of protein, fat, and carbohydrates by the ordinary methods of analysis and the consequent errors which are introduced when the fuel value of these constituents is calculated in the usual way. The importance of the errors is illustrated by calculating the energy value of a number of rations by the usual method and by the method which he proposes.

Concerning a modification of the formula devised by Chauveau, J. LEFÈVRE (*Compt. Rend. Soc. Biol.* [*Paris*], *56* (*1904*), *No. 17, pp. 807–809*).—A critical discussion of a formula proposed by Chauveau for calculating energy.

Notes on the relation between nutrition investigations and working power, E. WAXWEILER (*Rev. Soc. Sci. Hyg. Aliment.*, *1* (*1904*), *No. 2, pp. 113–116*).—A discussion of nutrition investigations as a part of sociological investigations, with special reference to the character of the work performed by the persons studied.

The work performed in riding a bicycle, W. BERG, R. DU BOIS-REYMOND, and L. ZUNTZ (*Arch. Anat. u. Physiol., Sup., p. 20; abs. in. Zentbl. Physiol.*, *18* (*1904*), *No. 22, p. 710*).—The energy which is required to propel a bicycle was measured by attaching it to a motor car and making a dynamometer test. A comparison of the results obtained with values which Zuntz has reported for the total energy expended by a bicycle rider showed that 25 per cent of the total energy expended by the rider is used for forward progression. The ordinary resistance in rapid riding, the effect of the position of body, the work of the legs, and other questions, were also studied.

The dependence of food upon heat balance judged by studies in the Tropics, in temperate regions, and at high altitudes, RANKE (*Hyg. Rundschau*, *14* (*1904*), *No. 24, pp. 1229–1231*).—In a paper presented before the seventy-sixth meeting of German Naturalists and Physicians the results of metabolism experiments were presented in relation to the food required in different climates, the data being dis-

cussed with reference to the high food requirements of cold regions as compared with the tropics. The various factors which make up climatic effect were pointed out and the possibility of modifying it in such ways as by heating rooms in cold regions was spoken of. (See also E. S. R., 15, p. 387.)

The consumption of fat in the Tropics (*Jour. Prat., 1904, May 21, p. 332; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 2, p. 181*).—Considerable fat is commonly observed in the diet of persons living in the tropics. It is pointed out that the increased transpiration and other conditions require a fairly large amount of energy, and that fat furnishes this in a convenient form.

Carbohydrate cleavage. II, The substance which renders pancreas active, O. COHNHEIM (*Ztschr. Physiol. Chem., 42 (1904), No. 4, pp. 401-409, figs. 2*).—The experiments reported have to do with the problem of carbohydrate cleavage in the body with special reference to the presence of glycolytic ferment in muscle.

Fiber and iron in the food of man, F. W. ROBISON (*Ann. Rpt. Michigan Acad. Sci., 6 (1904), pp. 125-127*).—The importance of crude fiber and iron in nutrition is spoken of. The author believes that the presence of the larger amounts of these constituents in whole wheat flour is favorable to its use in comparison with the finer grades.

The pharmacology of sulphur, A. HEFFTER (*Arch. Exper. Path. u. Pharmakol., 51 (1903), p. 175; abs. in Zentbl. Physiol., 18 (1904), No. 21, p. 673*).—According to the author the formation of hydrogen sulphid from free sulphur in the intestine is due to the action of proteids present in the mucous membrane. The blood cells possess the same property though the stomach mucous membrane does not, and by the intravenous injection of finely divided sulphur it is possible to produce hydrogen-sulphid poison.

The metabolism of sulphur and phosphorus on an abundant diet, K. BORNSTEIN (*Arch. Physiol. [Pflüger], 106 (1904), No. 1-2, pp. 66-79*).—The author was himself the subject of the experimental work described in which the income and outgo of nitrogen was studied, as well as the excretion of sulphur and phosphorus in the urine. In the case of sulphur the total quantity in the urine and the acid and neutral sulphur were determined, and in the case of phosphorus the total amount and the amount occurring in organic form. The author considers that the data furnish an additional proof of his theory that it is possible to induce gains in protein when an excess, especially milk protein, is supplied, provided, of course, the body has not already reached its protein limit. The gain in protein depends upon an increase in the quantity and an improvement in the character of the cell contents. The importance of overfeeding with protein when the body is in poor condition is spoken of.

The measurement of body temperature, E. OERTMANN (*Arch. Physiol. [Pflüger], 105 (1904), No. 7-8, pp. 425, 426*).—A maximum thermometer is described, which the author states may be worn in the rectum without inconvenience.

On the origin and precursors of urinary indican, F. P. UNDERHILL (*Amer. Jour. Physiol., 12 (1904), No. 11, pp. 176-183*).—The general plan of the experiments reported was to feed dogs in the fore and after periods a mixed diet containing lean meat, which was known to produce a large yield of indican and to replace the meat with gelatin in the middle period. It was found that feeding gelatin greatly diminished the amount of urinary indican. "The fact that gelatin will reduce the quantity of indican excreted—that is, causes a diminished formation of putrefactive products—is not alone of theoretical interest, but may prove of clinical importance in the treatment of certain conditions of the intestine where it is desirable to avoid the products of putrefaction."

Review of the literature of composition, analysis, and adulteration of foods for the year 1903, A. J. J. VANDEVELDE (*Separate from Bul. Serv. Surveill. Fabric. et Com. Denrées Aliment., 1904, pp. 101*).—This is the fourth annual volume reporting

titles of articles on analytical methods, apparatus, water, different food products, preservatives, beverages, and related topics. In a number of cases the bibliographical data are accompanied by notes which show the character of the article cited.

Variations in the composition of vegetable foods, L. MAQUENNE (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 2, pp. 97-104*).—Variations in the composition of vegetable foods are discussed and the author points out the need of recording maximum and minimum figures as well as averages in standard tables of composition.

The proteids of wheat gluten and their relation to the baking quality of wheat flour. II, Relation between the gluten content and the baking quality of wheat flour, J. KÖNIG and P. RINTELEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, pp. 721-728*).—Methods of studying the relation between the gluten content and baking quality are summarized and analyses and baking tests reported with several sorts of wheat and spelt flour. From only one of the spelt flours studied could gluten be obtained by washing. Good bread was obtained from all the samples of wheat flour. One of the samples of spelt flour contained practically the same amount of total gluten and alcohol-soluble proteid as the wheat flours, yet the bread made from it was of small volume and poor, the crust being hard and the crumb heavy. This confirms, according to the authors, the often-expressed opinion that neither the gluten content alone nor the relation between total gluten or gluten insoluble in alcohol to the gluten soluble in alcohol determines the baking quality of flour. It is either the case that other factors beside gluten determine the baking quality or that the methods at present in vogue are not sufficient to judge of the character of gluten. Attention is called to the need of further investigations.

The proteids of flour, W. E. MATHEWSON (*Industrialist, 31 (1904), No. 13, pp. 195-198*).—Data regarding the different proteids present in flour are summarized and analyses of 8 samples reported, which include in addition to the usual factors determinations of the different nitrogenous constituents and the percentage of gliadin in the gluten. The author states that the results of baking tests (which are not reported here) with these flours "would indicate that the amounts of the different proteids present in a flour do not enable us to estimate its quality from the breadmaker's standpoint. The properties of the proteids, e. g., their solubility, are very easily altered by slight external influences. Possibly as a result of this the presence of larger or smaller amounts of oil and ash, associated as they are so intimately with the other substances in the grain, may have a greater effect on the properties of the mixture than one would at first suppose."

Remarks on the popping of Indian corn, F. H. STORER (*Bul. Bussey Inst., 3 (1904), No. 4, pp. 74-79*).—The popping of corn having been attributed to the presence of oil, investigations were undertaken to secure information on this question. Kernels extracted with ether were allowed to dry slowly, and popped successfully on being heated, showing that the oil was not the cause of popping. Other questions were also studied. It was found that the quantity of water-soluble material was much the same in popped and unpopped corn, being 19.3 per cent in the popped corn and 21.12 per cent in the unpopped on the dry-matter basis.

Tests with cupric oxid showed that no more than mere traces of reducing material were present in either the popped or unpopped samples. It was found that corn lost moisture on popping, containing then 7.45 per cent as compared with 12.13 per cent raw. The tests made to learn whether soluble starch is formed by popping gave negative results.

Some tests were made to learn the influence of skin on the popping of the kernels and the popping qualities of different parts of the kernel. Skinned kernels would not pop, i. e., burst, at all. When kernels not skinned were cut in two crosswise, the halves nearest the cob did not pop, while the outer halves popped readily. When the skin was removed, neither portion would pop. When the kernels were cut in two lengthwise, both parts popped readily. When unskinned kernels cut into

quarters were tested, it was found that none of the quarters from the cob end would pop. Some of the quarters from the outer end of the grain popped, though other specimens would not. When cut in halves crosswise, soaked in ether for 5 days, and dried, the halves which came from the pointed end of the kernels popped successfully, while none of those from the inner end would pop. When the skins were removed and the kernels were soaked in ether 3 or 4 days and dried, no success was met with on trying to pop them.

"It is plain from the foregoing trials," the author states, "that the skin of the grain exerts a very decided influence on the act of popping. It would appear, indeed, that both the structure of the individual starch grains in the kernel and the toughness of the restraining skin which envelops them all act to control or modify the manner in which the moisture in the starch grains when suddenly heated is converted into steam of such high tension that the explosive act of popping results, whereby both the skin of the seed itself and the envelopes of most of the starch grains in the seed are ruptured."

In this article data are summarized regarding the work of other investigators, particularly that of H. Kraemer.[a]

Breadfruit meal, J. P. D'ALBUQUERQUE (*Agr. News [Barbados], 3 (1904), No. 70, p. 404*).—An analysis of breadfruit flour from St. Lucia is reported. This contained 12.13 per cent water, 3.51 per cent protein, 1.33 per cent fat, 77 per cent nitrogen-free extract, 3.98 per cent crude fiber, and 2.05 per cent ash.

An edible pith from a Madagascar palm, R. GALLERAUD (*Compt. Rend. Acad. Sci. [Paris], 138 (1904), No. 18, pp. 1120, 1121*).—A description is given of the edible pith of a Madagascar palm, probably *Medemia nobilis*, and proximate and ash analyses of the flour made from it are reported.

Maple sirup and sugar, H. E. BARNARD (*New Hampshire Sanit. Bul., 2 (1905), No. 6, pp. 90–93*).—The results of analyses of a number of samples of maple sirup and sugar are presented and some data on the manufacture of these products summarized. The author states that of 40 samples examined only 2 were pure.

The composition of two sorts of crude sugar sold in India, E. BOURQUELOT (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 27, pp. 197, 198*).—According to the analyses reported, sugar made from *Cocos nucifera* contains 1.99 per cent (initial) reducing sugar, 74.95 per cent saccharose when invertin is used, or 76.49 per cent with dilute sulphuric acid, 8.03 per cent water, and 4.73 per cent ash. Sugar from *Borassus flabelliformis* contains 2.40 per cent (initial) reducing sugar, 79.12 per cent saccharose when invertin is used, or 80.15 per cent with dilute sulphuric acid, 9.15 per cent water, and 3.20 per cent ash.

Examination of dried apricots, A. KICKTON (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, pp. 675–678*).—Analytical data are reported and the analytical methods followed are described.

A short history of the banana and a few recipes for its use (*Boston: United Fruit Co. [1904], pp. 29, figs. 19*).—A collection of recipes, by Janet M. Hill, for serving bananas in a variety of ways, together with some data regarding the production and marketing of this fruit.

The chemical composition of a number of sorts of Russian fruits and berries, T. CEREWITINOW (*Vyestnik Vinodyeliya, 1904, pp. 269–272; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 1, p. 47*).—Analyses of fruits and fruit juices are reported.

The chemical composition and pharmacological properties of the cowberry, A. KANGER (*Arch. Exper. Path. u. Pharmakol., 50 (1903), pp. 46–75; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 1, p. 48*).—A summary of an extended investigation of the cowberry (*Vaccinium vitis idæi*).

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[a] Science, n. ser., 17 (1903), p. 683.

The quantitative determination of organic-phosphorus compound in grape seeds and natural wines, J. WEIRICH and G. ORTLIEB (*Chem. Ztg., 28 (1904), No. 14, pp. 153, 154; Arch. Pharm., 242 (1904), No. 2, pp. 138–143*).—The identification of small quantities of lecithin in certain wines, according to the authors, explains in part their physiological properties.

Cucurbit seed oil, J. SCHUMKOW (*Vyestnik Shirov. Veshch., 4 (1903), pp. 29–31; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, p. 435*).—According to the author's analyses, Russian seed contained more oil than German seed, which is explained as due to the drier climate and soil.

Concerning oil from olive pits, N. PASSERINI (*Staz. Sper. Agr. Ital., 37 (1904), No. 7–8, pp. 600–609*).—The data reported have to do with oil from the pits of olives, especially with reference to its injurious effect on the quality of olive oil.

The nucleon in European oysters, E. CAVAZZANI (*Zentbl. Physiol., 18 (1904), No. 21, pp. 666–668*).—Determinations of the nucleon (sarco-phosphoric acid) in European oysters (*Ostrea edulis*) are reported, as well as the percentage of nitrogen and phosphorus in the nucleon. The amount of nucleon present on an average was 0.3725 per cent, which the author states is more than twice the quantity found in muscles, kidneys, and other organs of mammalia. The results are discussed in relation to the occurrence and function of nucleon in plants.

The chemical changes of meat brought about by mold, P. W. BUTJAGIN (*Arch. Hyg., 52 (1905), No. 1, pp. 1–21, pls. 2*).—The author reports investigations on the changes brought about in meat by *Penicillium glaucum* and *Aspergillus niger*. It was found that the growth of these molds caused a loss in dry matter and nitrogen and an increase in the amount of water-soluble nitrogenous bodies. The percentage amount of ether extract in the dry matter diminished, especially during the first month, and the amount of extractives was markedly increased, while the alkalinity of the meat increased slowly, being greater in the case of *P. glaucum* than in the case of *A. niger*. By the growth of these molds a gradually increasing amount of volatile acid was produced. The effect on the production of other bodies is also spoken of, the general conclusion being reached that the Penicillium studied destroys the constituents of meat more quickly than the Aspergillus.

Bad results which attend the use of preserved meat; causes and ways of preventing them, HUON and MONIER (*Compt. Rend. Soc. Biol. [Paris], 56 (1904), No. 8, pp. 383–385*).—Thorough inspection of live stock is insisted upon before preservation and the rejection of all suspicious animals.

ANIMAL PRODUCTION.

Analyses of cattle foods and miscellaneous substances, M. E. JAFFA (*California Sta. Rpt. 1904, pp. 49–53*).—Analyses are reported of carob beans, *Sesbania macrocarpa*, cactus plant, sesame oil-cake meal, cotton-seed oil-cake meal, milk, infant foods, and condensed milk, as well as a number of determinations of the fat in cream and of the gluten in wheat. Several of the analyses of cattle foods follow:

Composition of cattle foods.

Kind of food.	Water.	Protein.	Ether extract.	Starch, sugar, etc.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Carob bean	19.81	15.22	1.37	[a] 43.57	17.42	2.61
Sesbania macrocarpa	9.23	31.67	4.33	37.94	13.47	3.33
Cactus plant	75.01	1.74	.34	15.60	3.96	3.86

[a] Containing 24.51 per cent of cane sugar and 11.59 per cent of glucose.

Analyses are also reported of table salt, gypsum, volcanic ash, and magnesite, as well as a mineral analysis of onion chaff. The latter contained 4.89 per cent water, 7.89 per cent ash, 1.54 per cent nitrogen, 0.72 per cent phosphoric acid, 0.14 per cent potash (actual), and 4.34 per cent ether extract. In the author's opinion onion chaff would have more value as stall litter than as a fertilizer.

Licensed commercial feeding stuffs, 1904, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 118, pp. 50*).—Data are given regarding the guaranteed composition of the 52 brands of feeding stuffs licensed for sale in Wisconsin for the year ending December 31, 1904, as well as the results of analyses of a number of samples of licensed feeding stuffs, unlicensed feeding stuffs, feeds not subject to license, and miscellaneous feeds. A number of samples of unlicensed feeding stuffs not offered for sale in the State were also analyzed. The feeding stuffs analyzed included ground linseed cake, oil meal, viscid oil meal, cotton-seed meal, gluten meals and feeds, hominy feed, mixed corn and oat feeds, miscellaneous dairy feeds, animal meal and similar goods, poultry feeds, rape meal, distillers' grains, mixed and proprietary feeds, granulated bone, meat meal and similar products, wheat bran, middlings, red dog flour, cereal oil meal, corn distillers' grains, mustard-seed cake, rape-seed cake, corn, corn meal, oats (whole and ground), barley, ground spelt, dried brewers' grains, ground malt, malt sprouts, mixed feed, cereal middlings, buckwheat bran, and miller's smut. The text of the State feeding-stuff law is quoted.

In the case of the guaranteed feeds a large number were not up to the standard in composition, but the authors believe that the deficiencies were, as a rule, perhaps unintentional and "came from a lack of close supervision of the chemical composition of the output of the factories, rather than from any intention to deceive the consumers. In other cases, as for instance in the brands of the oil meals, a deficiency in protein was always accompanied by an excess of fat above the guaranty. In this case the buyer was not necessarily the loser, since the feeding value of fat for some purposes is at least equal to that of protein, but feeds of this class are, as a general rule, purchased for the sake of supplanting farm-grown crops or more starchy mill-feeds with protein, and the buyer has, at any rate, a right to obtain the feed which the guaranty of the dealer of the feed would suggest, and not one equally good."

Concentrated feeding stuffs licensed for sale in Wisconsin, 1905, F. W. WOLL (*Wisconsin Sta. Bul. 120, pp. 3–5, 7–9*).—A list is given of the feeding stuffs which are licensed for sale in the State in 1905, together with their guaranteed protein and fat content, and the text of the State feeding-stuff law is quoted.

Cacti as forage, R. H. FORBES and W. W. SKINNER (*Arizona Sta. Rpt. 1904, pp. 496, 497*).—Owing to the local interest in various sorts of cacti as cattle feeds, the chemical composition of a number of such plants was studied. In quoting the results the analytical data have been recalculated on the basis of fresh material.

Composition of cacti used as cattle feed.

	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cholla (*Opuntia fulgida*), without fruit	77.79	1.59	0.34	14.38	1.66	4.24
Cholla, fruit	79.45	1.37	1.16	12.44	3.00	2.58
Tasajo (*O. spinosior*), without fruit	74.54	1.77	0.49	15.99	2.58	4.63
Tasajo, fruit	78.95	1.46	1.36	10.96	4.50	2.78
Prickly pear (*O. englemanii*), stems	77.21	0.89	0.39	14.71	2.62	4.18
Sicilian spineless cactus, stems (from University grounds)	88.27	0.93	0.25	6.31	1.38	2.85

"The ash content of these cacti is very high, comparing with that of saltbushes grown in this region, and accounting for the purgative effect of this forage upon cattle. The proteids are distinctly less than in the saltbushes, but the carbohydrates, included in nitrogen-free extract, are greater. Very interesting are the high percentages of ether extract, which includes fatty substances, found in the fruit of *Opuntia fulgida* and *O. spinosior*. The prepared samples are perceptibly oily in character and the circumstance suggests a reason for the readiness with which cattle devour the fruit."

Examination of beet molasses of different sorts, T. DIETRICH and F. MACH (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 347-357*).—A large number of analyses are reported and discussed. On an average the molasses contained 22 per cent water and 78 per cent dry matter. The author calls attention to the low total and proteid nitrogen and nitric acid content of the samples, the total nitrogen being on an average 1.663 per cent of the fresh material.

Experiments on the feeding value of common heather, K. MÜLLER (*Ber. Physiol. Lab. Landw. Inst. Halle, 1903, No. 17, pp. 1-55*).—The experiments reported were made with milch cows and with sheep, the digestibility of the rations and the income and outgo of nitrogen being studied, as well as the composition of heather. In the case of the milch cows the effect of the ration on milk production was also investigated. The author concludes that the use of heather as a part of the coarse fodder of the ration did not diminish the secretion of milk or appreciably change its composition. Neither did it diminish the digestibility of the ration nor affect the general well-being of the animals.

In the case of sheep heather was fed without any concentrated feed. The nitrogen-free extract and pentosan were fairly well digested, but the coefficients obtained for protein and fat were rather low.

Some studies were made to learn how the tannic acid in the heather is excreted. Tests with iron-chlorid solution showed that no tannic acid was present in the feces. However, the urine, especially in the case of the sheep, gave a grayish blue precipitate which was regarded as more characteristic of gallic than tannic acid. The results of the investigation as a whole were favorable to the use of heather as a coarse fodder in times of scarcity.

A new fodder plant, Elodea canadensis, F. R. FERLE (*Fühling's Landw. Ztg., 53 (1904), No. 15, pp. 549-558*).—The author reports analytical data regarding water weed and summarizes information on its composition and feeding value, which led to the conclusion that this plant may be used as a cattle feed.

Sugar as a feeding stuff for farm animals, E. CUROT (*Le sucre dans l'alimentation des animaux. Paris: L. Laveur [1904], pp. 384; rev. in Jour. Agr. Prat., n. ser., 8 (1904), No. 48, p. 715*).—The value of sugar as a feeding stuff is discussed and information regarding its use is summarized, the volume being designed to meet the needs of both students and practical feeders.

The quantitative botanical analysis of feeding stuffs, A. MAURIZIO (*Landw. Vers. Stat., 60 (1904), No. 5-6, pp. 359-370*).—The importance of a quantitative botanical analysis of feeding stuffs is insisted upon and the value of a microscope in such work pointed out.

The heating or fermentation of hay, F. W. J. BOEKHOUT and J. J. O. DE VRIES (*Centbl. Bakt. u. Par., 2. Abt., 12 (1904), No. 22-24, pp. 675-681, pl. 1*).—Investigating the reason for the heating or fermentation of hay in stacks or barns, the authors found that the temperature in the interior of two heated stacks was 85 and 96°, respectively. The dry matter of normal hay contained 10.8 per cent protein, 2.0 per cent fat, 23.2 per cent nitrogen-free extract, 24.0 per cent pentosans, 31.6 per cent crude fiber, and 8.4 per cent ash. The dry matter of heated hay had the following percentage composition: Protein 11.5 per cent, fat 3.1 per cent, nitrogen-free extract

20.2 per cent, pentosans 20.6 per cent, crude fiber 35.4 per cent, and ash 9.2 per cent. In the case of heated hay a peculiar aroma and an acid vapor were noted. Tests showed that the acid formed was formic acid. The air in the interior of the heated stack contained more carbon dioxid than normal, but the authors do not feel certain that this was due to heating. A microscopical examination of very black heated hay showed that the epidermis cells and the fibrovascular bundles were not darkened. In the case of the other cells the protoplasm of the cells was darkened or wholly black, while the cell walls were not darkened more than could be accounted for by the diffusion of the cell contents. This, in their opinion, would indicate that the heating was not due to bacterial or enzymic action.

To determine whether the characteristics of heated hay could be produced without bacteria or enzyms sterilized hay, inclosed in a metal box, was heated at 95 and 100° for 20 days. Upon examination it was found to possess the characteristics of heated hay and analysis showed that it resembled the natural product in composition, the dry matter containing proportionally less nitrogen-free extract and pentosans and more protein, fat, crude fiber, and ash than the original material. Chemical tests showed the presence of formic acid and a microscopical examination showed that, as regards the appearance of the cells, the artificially heated hay resembled that heated in stacks. The investigations as a whole led to the conclusion that micro-organisms are not the immediate cause of the heating of hay, but that it is due to a chemical process.

Experiments on the assimilation by growing animals of the calcium and phosphoric acid of different calcium phosphates, Köhler (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, p. 683*).—A brief note on a paper presented at the seventy-sixth meeting of the German Naturalists and Physicians, at Breslau, September, 1904. In experiments with lambs the author found that calcium and phosphoric acid were most thoroughly assimilated in the form of precipitated calcium phosphate which, of course, is a mixture of tricalcium and dicalcium phosphate. Bone meal with the gelatin removed and calcined bones were less thoroughly assimilated. Freshly precipitated tricalcium phosphate was much better assimilated than has been commonly supposed.

The influence of alkalis on skeletal growth, H. Aron (*Arch. Physiol. [Pflüger], 106 (1904), No. 1-2, pp. 91, 92*).—A preliminary note on the effect of sodium and potassium on the metabolism of calcium and formation of bone. When the amount of sodium in the ration was much diminished and the amount of calcium much increased the gains in calcium and bone formation were less than normal, although the diet contained an abundant supply of calcium and phosphorus. The tests were carried on with calves.

Experiments on the influence of food on the length of the intestine, E. Babák (*Zentbl. Physiol., 18 (1904), No. 21, pp. 662-666*).—The experiments reported were made with tadpoles fed different sorts of food. A diet of both animal and vegetable food increased the length of the intestine, the vegetable food most markedly, and an excess of carbohydrates did not produce such an effect. The author concludes that the lengthening is largely due to chemical rather than mechanical stimulation, plant protein being the most active of the nutrients studied.

The formation of sugar from protein, H. Lüthje (*Arch. Physiol. [Pflüger], 106 (1904), No. 3-4, pp. 160-167*).—In a polemical article on the formation of sugar from protein, the author reports an additional experiment in support of his contention that such formation is possible. A dog with the pancreas removed was fed nutrose and later casein—i. e., a diet practically free from carbohydrates, and excreted 1,176 gm. of sugar in the experimental period which covered 25 days. Taking into account what was regarded as the maximum amount of preexisting glycogen supplied by the body the author calculates that 919 gm. of sugar must have been formed from the food.

The importance of tissue for storing water, W. ENGELS (*Arch. Exper. Path. u. Pharmakol., 51 (1903), No. 4-6, p. 346; abs. in Zentbl. Physiol., 18 (1904), No. 21, p. 677*).—In the tests reported, which were made with dogs deprived of water and others which had had physiological salt solution injected into the tissues, samples of the organs were weighed before and after drying. It was found that two-thirds of the water contained in the body was present in the muscular tissue, one-sixth in the skin, and one-sixth in the remainder of the body. The water taken up by the muscles is therefore very large in proportion to their relation to total body weight. The smallest proportion of water was taken up by the blood.

The universal presence of erepsin in animal tissues, H. M. VERNON (*Jour. Physiol., 32 (1904), No. 1, pp. 33-50*).—According to the author's observations the peptone-splitting ferment erepsin is present in all animal tissues, the kidney containing the largest amount with warm-blooded animals, the proportion being greater than in the intestinal mucous membrane. The pancreas, spleen, and liver ranked next in order. The tissues of mammals were found, as a rule, to be somewhat richer in ferment than those of the pigeon, and those of warm-blooded animals distinctly richer than those of cold-blooded animals.

The production and use of meat in Switzerland, H. NATER (*Forschungen auf dem Gebiete der Landwirtschaft. Festschrift zur Feier des Siebenzigsten Geburtstages von Prof. Dr. Adolf Kraemer. Frauenfeld: J. Huber, 1902, pp. 295-318; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, pp. 740, 741*).—Statistical data are reported and discussed.

The feeding and management of live stock, T. SHAW (*St. Anthony Park, Minn.: Webb Pub. Co., 2. ed., pp. 99*).—A syllabus of 30 lectures, covering the principles of animal feeding, the composition and nutritive value of feeding stuffs, and the feeding and management of farm animals.

Zootechny: Sheep, goats, pigs, P. DIFFLOTH (*Zootechnie des Moutons, Chèvres et Porcs. Paris: J. B. Baillière & Sons [1904], pp. 418, figs. 90; rev. in Jour. Agr. Prat., n. ser., 8 (1904), No. 48, p. 715*).—Breeds, feeding, management, diseases, and other topics are discussed, a large amount of data being summarized. The present volume is similar in scope to the treatise on cattle by the same author previously noted (E. S. R., 15, p. 995).

Cattle, swine, and goat raising, F. LASSMANN (*Arb. Deut. Sek. Landeskulturrates Königr. Böhmen, 1904, No. 8, pp. 93, maps 5, chart 1*).—Various problems connected with the cattle, swine, and goat industry are discussed, with special reference to the intelligent development of these industries, and attention is called to the work of the Bohemian Government in this direction. An appendix contains statistics relative to the cattle census of 1890-1900.

Steer feeding, T. F. MCCONNELL (*Arizona Sta. Rpt. 1904, pp. 483-488*).—In a test covering 11 months soiling alfalfa was compared with using this crop for pasturage. The steers fed by soiling were given some alfalfa hay during the winter, and the lot on pasturage were given a little foxtail hay during December and January. The total gain made by the 4 steers fed by soiling was 1,180 lbs., as compared with 1,765 lbs. made by the 4 steers pastured on alfalfa. The fact that the steers made moderate gains during the winter when fed alfalfa hay, while those on pasture did not gain during a corresponding period, is pointed out. A pound of gain required 23.8 lbs. of alfalfa hay, and the gain was very expensive, $2.38 worth of hay being required to produce $1 worth of beef. "It is evident that so far as these results can indicate, with anything like the present market conditions for beef and hay, the feeding of hay is a ruinous procedure so long as cattle can barely subsist on pickings during the time of short winter pasture. This is possible in the mild climate of the Southwest to an extent impossible in the colder regions of the North, where hay is essential for carrying feeders through."

In a test of alfalfa alone as compared with alfalfa supplemented by Egyptian corn (heads and stalks), barley (grain and straw), wheat hay, and sorghum hay it was found that 4 steers on alfalfa alone gained 720 lbs. in 7 months, while an equal number fed the mixed ration gained only 365 lbs. The alfalfa was used as a soiling crop and as hay. The author notes that during the winter when hay was fed the gains on the alfalfa ration were especially marked.

In a discussion of the economy of soiling as compared with pasturage it is stated that 50 lbs. of green alfalfa was required per pound of gain when used as a soiling crop and 52 lbs. when used as pasturage. "These tentative figures, obtained with range steers, could doubtless be improved upon with tame valley-bred animals."

A test of calf rations, A. L. Haecker (*Nebraska Sta. Bul. 87, pp. 3–10, figs. 3*).—Using 3 lots of 8 calves each the relative merits of linseed meal, corn germ oil meal, and corn oil for supplementing skim milk were studied. The linseed meal and the corn germ oil meal were at first mixed with the skim milk and later with the corn and oats, which formed a part of the ration. One-half teacupful at a feed was the maximum amount given. The corn oil was emulsified with skim milk by churning 4 or 5 minutes. The emulsion would last for only about 20 minutes, which was, however, long enough for the purpose. At first a 3 per cent mixture was used, but as this proved laxative the amount of oil was reduced to 2 per cent. The grain feeding generally began when the calves were 6 weeks old, and hay or grass was supplied at all times. In the 24 weeks of the test the average gain on linseed meal was 229 lbs. and the cost of a pound of gain 4.6 cts. Similar values on the corn germ oil meal were 237.37 lbs. and 4.7 cts., and on corn oil 224.12 lbs. and 5.9 cts. The author's conclusions follow:

"From the results obtained in this experiment it is safe to say that linseed meal is not only an excellent food for replacing butter fat in skim milk for calf feeding, but also an economic food in comparison with others.

"Germ oil meal gave about as good results as linseed meal and may be recommended as a calf food.

"Corn oil in this test proved too expensive and required too much work for profitable calf rearing. A 2 per cent oil mixture proved rather laxative for obtaining the best results.

"The calves fed linseed meal and germ oil meal were in good condition at the end of the test.

The Africander breed of cattle, A. C. Macdonald (*Transvaal Agr. Jour., 3 (1904), No. 9, pp. 1–4*).—The breed known as Africander cattle is described and their uses for draft purposes and as beef and dairy animals pointed out. The author calls attention to the fact that although little attention has been paid to their milking qualities many of the cows are fair milkers, giving milk very rich in butter fat. Methods for improving the breed are suggested.

Pasturing sheep on weedy ground, T. F. McConnell (*Arizona Sta. Rpt. 1904, p. 488*).—During the year a flock of 15 ewes has been pastured on weedy corners and ditch banks, being confined by a portable fence. "They were effective in clearing up weedy places and checking growth of vegetation along ditch banks, but with no profit from a feeder's point of view."

Pig breeding in Ireland (*Jour. Dept. Agr. and Tech. Instr. Ireland, 5 (1904), No. 1, pp. 75–86, fig. 1*).—Pig breeding, feeding, and management are discussed, with special reference to the methods which are considered in Ireland to be the most successful.

On pig breeding and bacon curing, J. de Mestre (*Transvaal Agr. Jour., 3 (1904), No. 9, pp. 10–12*).—Pig breeding and fattening is discussed and brief directions are given for slaughtering and dressing and for curing meat, the article being adapted to the needs of farmers and others who wish to prepare pork for home use.

Notes on the feeding of horses, J. SABATIER (*Jour. Agr. Prat., n. ser., 9 (1905), No. 4, pp. 114–116*).—The author discusses the feeding value of sugar beets, beet chips, and other feeding stuffs, summarizing the results of his own experience as well as that of other feeders.

The horse in Ireland (*Jour. Dept. Agr. and Tech. Instr. Ireland, 5 (1904), No. 1, pp. 18–33, figs. 13*).—The need of improving Irish horses is insisted upon on the basis of statistical and other data regarding the present condition of the local horse-breeding industry. The merits of the old Irish draft horses are spoken of, and it is suggested that steps be taken to reestablish this breed, which only a few years ago was quite numerous.

Poultry keeping as an industry for farmers and cottagers, E. BROWN (*London: Edward Arnold, 1904, 5. ed., pp. VIII+205, pl. 1, figs. 110*).—The author states that this volume, designed as a handbook for poultry raisers, has been revised and enlarged. The new chapters have to do with climate and soil in relation to poultry culture, marketing the produce, and the economics of poultry keeping. Chapters which have been especially enlarged are, among others, those on feeding, fattening, housing, duck farming, turkey farming, and production and preservation of eggs.

Poultry feeding and proprietary foods, M. E. JAFFA (*California Sta. Bul. 164, pp. 28, fig. 1*).—The principles of feeding, composition and digestibility of feeding stuffs, and related questions are discussed and a table showing the composition of a number of poultry feeds is given, based in part upon analyses made at the station. Compounding rations is spoken of at length, and to facilitate the calculation of the nutritive value of the ration a table is given showing the amount of nutrients supplied by 0.5 or 1 to 5 lbs. of a considerable number of poultry feeds. Sample rations are suggested. Analyses are reported of 37 proprietary or condimental poultry feeds from which the following are quoted:

Composition of poultry feeds.

Name of feed.	Water.	Protein.	Fat.	Carbohydrates. Starch and sugar.	Carbohydrates. Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Calfalfa (alfalfa meal)	10.85	17.20	1.58	36.45	26.27	7.65
Shredded clover	10.00	16.32	1.75	45.99	17.84	8.10
Clover meal (sample No. 22)	11.80	15.54	2.06	32.94	29.66	8.00
Clover meal (average of samples No. 25 and No. 34)	3.68	11.86	1.55	43.57	32.50	6.85

The bulletin contains a list of experiment station and Department of Agriculture bulletins on poultry and poultry management which are available for distribution.

Winter egg production, H. DE COURCY (*Jour. Bd. Agr. [London], 11 (1904), No. 9, pp. 529–533*).—The relation of breeds, age, housing, feeding, etc., to the winter production of eggs is discussed. On the basis of numerous experiments the author recommends the following method of feeding as the one which in his experience has given the best results: In the morning, when the fowls come from the roosting house to the scratching shed, they are given a few handfuls of cracked Indian corn scattered in the litter and about 11 o'clock a full feed of mash made of steamed finely cut clover hay, barley meal, Indian meal, bran, and cut green bone 3:2:2:2:1, mixed to a stiff mash with skim milk a few hours before feeding. At midday a small amount of wheat is scattered in the litter in the scratching shed and at evening the hens are fed whole grain about an hour before roosting time. "It is advisable to feed a variety of grains, not mixed together, but one on each evening; wheat, Indian corn, oats, barley, and sunflower seeds have been found to be good foods for promoting

Experiment on the most suitable nutritive ratio for milch cows, W. THIENEMANN (*Fühling's Landw. Ztg., 54 (1905), Nos. 1, pp. 13–22; 2, pp. 51–55*).—In an experiment with 2 cows, covering 5 periods of 15 days each, nutritive ratios of 1:7.34, 1:8.10, and 1:8.23 were compared with a ratio of 1:6.5. The results show that a diminution in the quantity of protein fed with a corresponding increase in the quantity of carbohydrates produced a decrease in the yield of milk. The percentages of fat and protein in the milk were also somewhat decreased. Variations in the protein and fat in the milk were always in the same direction. The live weight of the animals was increased by a slight widening of the nutritive ratio, but considerably decreased by a still greater widening of the ratio. From a practical standpoint it is considered questionable if the ratio can be widened beyond 1:7.34 without unfavorable results. A ratio of 1:8.10 is believed to be unprofitable.

A comparison of feeding standards for dairy cattle, LINCKH (*Fühling's Landw. Ztg., 54 (1905), Nos. 3, pp. 73–83; 4, pp. 120–132; 5, pp. 159–172*).—This is a somewhat detailed presentation and discussion of the relative merits of the feeding standards of Lehmann, Kühn, Märcker, Pott, and Stutzer for dairy animals.

Feeding standards, A. STUTZER (*Fühling's Landw. Ztg., 54 (1905), No. 7, pp. 225–232*).—This is a discussion of feeding standards with especial reference to some of the conclusions drawn by Linckh.

The Danish food units and the control associations, KAISER (*Milch Ztg., 34 (1905), Nos. 1, pp. 3–5; 2, pp. 15, 16; 3, pp. 27–29*).—This includes a discussion of the system of units used in Denmark to indicate the relative feeding value of different materials, a summary of the results obtained in the feeding experiments which have been in progress for a series of years, and remarks on the application of Danish methods to German conditions.

Skim milk for milch cows, C. L. BEACH and A. B. CLARK (*Connecticut Storrs Sta. Rpt. 1904, pp. 148, 149*).—The experience at the station has been unfavorable to the utilization of skim milk as a food for cows. Only 4 out of 24 cows could be induced to drink it, although various expedients, such as placing grain in the milk, were employed. A comparison was made of the production of 3 cows fed skim milk and 9 cows fed grain. It is estimated that the substitution of 2,016 lbs. of skim milk for 252 lbs. of grain resulted in a saving of $3.82.

Yield of front and rear udder of the cow, C. L. BEACH and A. B. CLARK (*Connecticut Storrs Sta. Rpt. 1904, pp. 131–134, figs. 3*).—Records of 15 cows milked twice and of 15 cows milked once are reported. In the first instance, 42.3 per cent of the total yield was produced by the front quarters and 57.7 per cent by the rear quarters. In the second instance 38.8 and 61.2 per cent were produced by the front and rear quarters, respectively. Brief notes are given on the development of the udder in relation to the capacity for milk secretion, but the observations recorded are considered too few to justify the comparison of the milk yield with types of udders.

The milk yield of quarters on same side of udder, C. L. BEACH (*Connecticut Storrs Sta. Rpt. 1904, pp. 135–137*).—In an experiment with 5 cows the different quarters of the udder were milked in succession, the order being varied in different milkings. It is stated that if the quarters on the same side of the udder can draw milk from each other, then either quarter on the same side should give more milk when milked first than when milked last, but this was not found to be the case. The percentage of the total milk obtained from the quarter milked first was 25.9 per cent, from the quarter milked second 26.4 per cent, from the quarter milked third 24.6 per cent, and from the quarter milked last 23.1 per cent. As the yield from each quarter enters into each average the differences are attributed to the order in which the quarters were milked.

Methods of milking, F. G. KRAUSS (*Hawaii Sta. Bul. 8, pp. 15, figs. 5*).—The Hegelund or manipulation method of milking was tested with 2 cows during 3 10-day

periods. The records of 1 cow showed a total yield of 474.61 lbs. of milk and 20.38 lbs. of fat from the regular milking and 21.23 lbs. of milk and 1.821 lbs. of fat from the after milking. The percentages of fat in the 2 portions of milk were 4.29 and 8.56. The records of the other cow showed a total yield of 661.12 lbs. of milk and 23.66 lbs. of fat from the regular milking and 21.36 lbs. of milk and 1.36 lbs. of fat from the after milking, the fat content of the 2 portions of milk being 3.58 and 7.82 per cent. The average daily yield of milk of the 2 cows was, therefore, increased 1.21 per cent and the yield of butter fat 7 per cent.

It is estimated that by the use of the manipulation method the annual income from the average dairy cow could be increased $10, or that 10 cows could be made to produce as much as 11 cows by the ordinary method of milking. As the regular milking was done very thoroughly it is believed that the experiments show only minimum results obtained by the manipulation method. A description of the Hegelund method of milking is taken from Wisconsin Station Bulletin 96.

Methods of controlling contamination of milk during milking, A. L. Haecker and C. W. Melick, (*Nebraska Sta. Bul. 87, pp. 11-17, figs. 4*).—Petri dishes were exposed under udders which had been (1) sponged with water, (2) sponged with 5 per cent carbolic-acid solution, (3) smeared with vaseline, and (4) merely brushed with the hand. The motions of milking were gone through with, although no milk was drawn. When the exposures were made in the stable the number of colonies which developed in the petri dishes exposed under udders treated with carbolic-acid solution was 344, under udders treated with vaseline 346, under udders treated with water 483, and under udders not treated 20,500. When the exposures were made in the pasture the corresponding numbers were 86, 92, 120, and 310. In stables having cement floors the air contained a smaller number of bacteria than in stables having wooden floors. The use of bedding increased the number of bacteria in the air. In all some 200 petri dishes were exposed.

On account of cheapness and convenience and its almost equal efficiency, sponging the udder with water is recommended for general use. In summer when the cows are stabled only during milking it is considered better to dispense with bedding. Milking out of doors in clean yards or pastures is preferable to milking in stables even when these are kept in the best condition.

Test of cows for advanced registration, C. L. Beach and F. G. Comins (*Connecticut Storrs Sta. Rpt. 1904, pp. 141-146, figs. 3*).—Tests of 3 cows owned by the Connecticut Agricultural College are reported.

Calculating the weight of cows from measurements, M. Matievic (*Oesterr. Molk. Ztg., 11 (1904), No. 19, pp. 261-263, figs. 2*).—Methods applicable to cattle and also to sheep, pigs, and horses are discussed.

Improvement of the breeds of milch sheep of Roquefort, E. Marré (*Indus. Lait. [Paris], 30 (1905), No. 7, pp. 74-76*).—The special characteristics desirable in breeds of sheep used for dairy purposes are mentioned and the improvement of such breeds, especially by selection, is briefly discussed.

Goats' milk in winter, H. Rüegg (*Landw. Jahrb. Schweiz, 18 (1904), No. 10, pp. 481-490*).—The possibility of breeding goats so as to have fresh milk at other seasons of the year than in the spring was tested in experiments from 1896 to 1903 with favorable results.

Practical manual of dairying, E. Tosi (*Rev. in Rev. Gén. Lait, 4 (1905), No. 7, pp. 164, 165*).—This is said to be a well-written manual covering in a practical manner the different phases of the dairy industry.

A study in milk secretion, C. L. Beach (*Connecticut Storrs Sta. Rpt. 1904, pp. 138-140*).—Eight cows were milked twice a day (5:15 a. m. and 4:45 p. m.) during 2 periods and 3 times a day (5:15 and 11 a. m. and 4:45 p. m.) during an intervening period of 5 days. When milked 3 times a day the average daily yield of milk was increased 3 lbs. or 13.6 per cent, and the yield of butter fat 0.15 lb. or 14.1 per cent,

The nervous condition of the cows at 11 o'clock, due to this unusual hour of milking, is believed to be responsible for an increase in the secretion of milk at that time. No single theory of milk secretion yet advanced is believed by the author to be entirely satisfactory.

Variations in the composition of the milk of domestic animals, K. Storch (*Tierärztl. Zentbl., 27 (1904); abs. in Rev. Gén. Lait, 4 (1904), No. 6, pp. 139–141*).—Data are given on the composition of human milk and the milk of the cow, mare, ass, goat, and sheep. Variations in the percentages of the different constituents, such as fat, proteids, and phosphates are discussed and mention is made of some investigations of the author showing that the chemical reaction of milk is independent of the food. Variations are believed to exist in the nature of the different constituents of milk depending upon the species of the animal.

Causes of variation in the butter-fat percentages and weight of milk and cream, G. S. Thomson (*Queensland Agr. Jour., 15 (1904), Nos. 3, pp. 626–633; 4, pp. 675–679*).—Causes affecting the yield and composition of milk and cream, such as breed of cows, methods of feeding, milking, conditions of separation, etc., are discussed and experimental data showing the losses of fat in buttermilk in relation to acidity of cream, the fat content of cream, the distance of shipping, and time of delivery, the use of preservatives in milk and cream, etc., are reported.

The chemical composition of cows' milk in Lombardy with reference to the milk regulations of Milan, G. Billitz (*Milchw. Zentbl., 1 (1905), No. 3, pp. 113–122*).—During the 10 years from 1892 to 1902 analyses were made of 187,610 samples of milk coming from 20,813 cows. Monthly averages for the 10 years are reported and some data are also given on variations. The average composition of the samples was as follows: Specific gravity 1.0315, fat 3.55 per cent, solids-not-fat 8.81 per cent, and total solids 12.36 per cent. The new milk regulations of the city of Milan require a content of total solids of 12 per cent, 3 per cent fat and 9 per cent solids-not-fat, which is somewhat higher than the average composition of market milk in that city.

[Composition of milk in Porto Rico], R. del Valle (*Office Health, Charities, and Correction [Porto Rico], Bul. 5, pp. 32*).—A preliminary report is made upon a study of the composition of the milk of cows fed on different native grasses, the results being considered as indicating that the influence exerted by the kind of food used has not the importance generally attributed to it. Varying percentages of water were added to milk and different quantities of cream were removed from other samples and analyses were made of the resulting products for the purpose of using the data obtained in connection with milk inspection.

Contribution to the study of slowly creaming milks, L. Marcas (*Bul. Agr. [Brussels], 20 (1904), No. 6, pp. 1221–1230*).—This is a continuation of earlier studies (E. S. R., 15, p. 811) of a type of milk in which the cream rises very slowly. Centrifugal separation of fat in such milk was found to be less complete even when the speed of the separator was greatly increased or when the milk remained longer in the bowl, but was practically equal to that of ordinary milk when the temperature was raised to about 60° C. It is believed that in separating a temperature of 40° to 45° is better than the generally recommended one of 35°. Unpasteurized cream from slowly creaming milk ripened slower, required a longer time to churn, showed a higher percentage of fat in the buttermilk, and produced butter of inferior quality as compared with ordinary cream.

Have the fat globules of milk a proteid membrane? A. A. Bonnema (*Pharm. Weekbl., 1904, No. 39; abs. in Milchw. Zentbl., 1 (1905), No. 1, pp. 26–32*).—A discussion of this question, which is answered in the negative.

The effect of different temperatures in determining the species of bacteria which grow in milk, H. W. Conn and W. M. Esten (*Connecticut Storrs Sta. Rpt. 1904, pp. 27–88*).—Descriptions are given of 9 groups or types of bacteria in milk and

experiments concerning the relative development of these types in market milk at temperatures ranging from 1 to 37° C. are reported in detail. Some general conclusions are drawn from the results of the present and earlier investigations (E. S. R., 15, p. 909).

The development of different types of bacteria in ordinary market milk is believed to be closely associated with temperature. The initial period, in which there is no increase in the total number of bacteria, is very short when the milk is kept at 37° C., but may be 6 to 8 days when the milk is kept at 1°. Following this period the bacterial content of the milk shows great diversity, depending upon the temperature.

At 20° the ordinary lactic-acid bacteria develop rapidly and at the end of about 40 hours, when the milk becomes curdled, *Bacillus acidi lactici* constitutes commonly over 90 per cent of the total number of bacteria. At this temperature other species are almost completely held in check by the lactic-acid bacteria.

At 37° the results are quite different. *B. lactis aerogenes* commonly predominates over *B. acidi lactici*. *B. coli communis* when present also grows rapidly.

At 10° all types of bacteria develop somewhat uniformly after the first 2 or 3 days, none of the lactic-acid types being favored. Neutral bacteria usually grow rapidly and liquefiers often become abundant. This temperature is not so favorable for the development of the lactic-acid bacteria as 20°. As the growth of other species of bacteria at this temperature is less retarded, the wholesomeness of the milk is more under suspicion. Except as regards the rapidity of bacterial growth there is but little difference between 10° and 1°.

"Milk is not necessarily wholesome because it is sweet, especially if it has been kept at low temperatures. At the temperature of an ice chest milk may remain sweet for a long time and yet contain enormous numbers of bacteria, among which are species more likely to be unwholesome than those that develop at 20°. From this standpoint the suggestion arises that instances of ice-cream poisoning are perhaps due to the preservation of cream for several days at a low temperature, such treatment keeping the milk sweet, but favoring the development of species of bacteria that are, at higher temperatures, checked by the lactic organisms."

The so-called "germicidal property" of milk, W. A. Stocking, Jr. (*Connecticut Storrs Sta. Rpt. 1904, pp. 89–106*).—Experimental work is reported and conclusions are drawn which coincide with those previously noted (E. S. R., 15, p. 185). It is believed that "the decrease in the numbers of bacteria during the first few hours is not the result of any 'germicidal condition or property' possessed by the milk, but simply of the natural dropping out of those species which do not find the milk a suitable medium in which to develop." Typical lactic-acid bacteria are stated to multiply continuously from the outset.

Associative action of bacteria on the souring of milk, C. E. Marshall (*Science, n. ser., 21 (1905), No. 535, p. 492*).—A proteolytic bacillus isolated from milk but not yet described, when associated with *Bacillus acidi lactici* increased the acidity and hastened the curdling of milk over lactic-acid bacteria alone. The lactic-acid bacteria developed more rapidly when associated with the proteolytic bacteria than when grown in pure cultures. The products of the proteolytic bacteria exerted the same influence as the presence of the living organism. A detailed account of the work, including a description of the proteolytic bacillus, is to be published soon.

On the formation of volatile alkaloids in sterilized skim milk by Bacillus nobilis and the occurrence of such compounds in Emmenthal cheese, L. Adametz and T. Chszaszcz (*Oesterr. Molk. Ztg., 12 (1905), Nos. 3, pp. 35, 36; 4, pp. 50, 51; 5, pp. 62, 63*).—From skim-milk cultures of *Bacillus nobilis* 22 months old the authors isolated a white, crystalline, odoriferous substance which proved to be a volatile alkaloid easily soluble in alcohol, ether, and dilute acids, difficultly soluble in water at ordinary temperature, and insoluble in concentrated sodium and potassium hydroxids. A molecular rearrangement was brought about by the use of

ammonia. Phosphomolybdic acid produced a canary-yellow precipitate; phosphotungstic acid a white precipitate soluble in an excess of the reagent; mercuric potassium iodid a sulphur-yellow precipitate consisting of long needles; and gold chlorid a lemon-yellow precipitate from which metallic gold separated after a short interval. No precipitate was produced by platinum chlorid and tannin. A concentrated solution of picric acid produced a precipitate consisting of cylindrical crystals soluble on the addition of water. From oxalic-acid solutions the alkaloid passed over in the first portion of the distillate. Further investigations are to be made concerning the chemical nature and physiological action of this alkaloid, to which the name tyrothrixin is given on account of its production by bacteria of the Tyrothrix group. From an Emmenthal cheese $1\frac{3}{4}$ years old a substance similar to, if not identical with, the alkaloid from the skim milk was obtained.

The catalase of milk, E. Reiss (*Ztschr. Klin. Med.* [*Berlin*], *56* (*1905*), *pp. 1–12; abs. in Bul. Inst. Pasteur, 3* (*1905*), *No. 5, p. 208*).—Catalase adheres to the fat globules in milk and may be separated from cream by washing with water or physiological salt solution. If milk is agitated with infusorial earth the greater part of the catalase is found in the earth, only a small portion being found in the cream and still less in the milk plasma in which the catalase is insoluble.

Contribution to the question of the influence of high temperatures on tubercle bacilli in milk, C. Barthel and O. Stenström (*Rev. Gén. Lait, 4* (*1904*), *No. 5, pp. 97–104; Centbl. Bakt. u. Par., 1. Abt., Orig., 37* (*1904*), *No. 3, pp. 459–463*).—The author studied the effect of the reaction of milk upon the destruction of tubercle bacilli by heat. In one experiment milk rendered alkaline by sodium hydroxid, milk rendered acid by the addition of sulphuric acid, and a control sample were inoculated with human tubercle bacilli, the three portions being pasteurized at 70° C. for 2 minutes. In a second experiment milk from a tuberculous cow was used, the pasteurizing temperatures employed being 80° and 85°. The results are considered very positive and constant. In all cases where milk was coagulated the tubercle bacilli resisted the heat, while in all cases in which there was no coagulation the tubercle bacilli were killed, notwithstanding a strong alkaline reaction in some instances. The potassium hydroxid and sulphuric acid were without influence on the virulence of the tubercle bacilli, as shown by the results of inoculation experiments with guinea pigs. The resistance of the human tubercle bacilli to heat was believed to be due to the protecting influence of the sputum in which the bacilli were contained. The experiments are believed to prove that a temperature of 80° for 1 minute is sufficient to kill all tubercle bacilli in milk in which there is no coagulation.

Raw or heated milk, H. Brüning (*München. Med. Wchnschr., 52* (*1905*), *No. 8, pp. 349, 350*).—In studying the influence of pasteurization the author made use of a litter of 4 puppies, 2 of which were fed naturally, 1 was fed pasteurized cows' milk, and 1 raw cows' milk. Very unfavorable results followed the use of cows' milk, raw milk being even more unfavorable than pasteurized milk. Pathological changes in the bones were observed in animals fed cows' milk. Other experiments with goats and pigs have been conducted, but reference is made here only to the results with dogs.

On Barlow's disease, E. Peiper and R. Eichloff (*Abs. in Milchw. Zentbl., 1* (*1905*), *No. 1, pp. 32, 33*).—Young dogs fed exclusively on pasteurized milk showed certain changes in the osseous and circulatory systems, such as anemia of the bone marrow and lower percentages of fibrin and ash in the blood as compared with dogs fed raw milk. The experiments are preliminary to a study of the influence of feeding the young with pasteurized milk.

Comparison of methods of preserving milk samples, T. F. McConnell (*Arizona Sta. Rpt. 1904, p. 487*).—Potassium bichromate and formalin were compared as preservatives for milk samples in experiments beginning in March and lasting for 16

weeks. Formalin was found to be an excellent preservative, but in no way superior to the bichromate, which latter is considered preferable, as it colors the milk and is also easily and accurately measured. As regards the fluidity of the samples no difference was observed in favor of either preservative, both giving clear readings when the temperature was not too high.

The addition of formalin to milk according to the method of von Behring, O. Stenström (*Rev. Gén. Lait, 4 (1904), No. 3, pp. 49–55*).—The publications of von Behring relating to the use of formalin in the preservation of the milk of cows rendered immune to tuberculosis are reviewed and experiments are reported in which formalin in the proportion of 1:10,000, 1:5,000, and 1:1,000 was added to tuberculous milk to determine the influence of formalin in destroying tubercle bacilli. As shown by the results of inoculation experiments with guinea pigs, the addition of formalin in the proportions mentioned can not be depended upon to destroy tubercle bacilli in milk.

The reform of the milk supply, G. F. McCleary (*Public Health [London], 17 (1905), No. 7, pp. 419–436*).—The author believes that an adequate reform of the milk supply can be brought about only by the extension of the principle of direct municipal ownership and supply.

A pure milk supply, A. J. Laird (*Public Health [London], 17 (1905), No. 7, pp. 437–444, figs. 8*).—The possibility of producing clean milk is discussed and illustrations are given of a number of cow sheds, the unsanitary condition of which is commented upon.

The dangers of faultily constructed milk shops, W. Robertson (*Public Health [London], 17 (1905), No. 7, pp. 445–451, figs. 2*).—In discussing this subject the author gives a brief account of an outbreak of scarlet fever traceable to what is considered a poorly arranged dairy.

Significance and production of Walker-Gordon milk, I. O. Johnson (*Ann. Rpt. Michigan Acad. Sci., 6 (1904), pp. 131–134*).—A brief history of the Walker-Gordon establishments with the rules governing them.

Infantile mortality and infants' milk depots, G. F. McCleary (*London: P. S. King & Son, 1905, p. 135; rev. in Public Health [London], 17 (1905), No. 7, pp. 473, 474*).—This is said to contain an account of the history and practical working of the milk depots in England.

New physical-chemical methods of milk analysis. Distinction between physiological and pathological cows' milk, C. Schnorf (*Neue physikalisch-chemische Untersuchungen der Milch. Unterscheidung physiologischer und pathologischer Kuh-Milch. Zürich, 1905; rev. in Rev. Gén. Lait, 4 (1905), No. 9, pp. 210, 211*).—The author has investigated certain methods with a view of determining the sanitary condition of milk. Determinations of the index of refraction, freezing point, and electric conductivity were made on about 4,000 samples of normal milk, colostrum, and pathological milk. The methods as used are described and the results are reported in tabular form. By means of the 3 methods mentioned it is considered possible to obtain some information as to the health of dairy animals and especially the conditions of the organs concerned in milk secretion.

Further investigations on the refraction of milk serum, J. Wittmann (*Österr. Molk. Ztg., 12 (1905), No. 6, pp. 75–77*).—Determinations of the index of refraction of the milk of healthy and diseased cows failed to convince the author that this method can be depended upon. Very often the milk of healthy and tuberculous cows gave the same results. For the detection of the addition of water to milk this method is believed to be useful only in connection with other data. An editorial note is appended to this article in which results up to the present time are briefly reviewed, the conclusion being drawn that this method is not absolutely a safe means of detecting the milk of diseased animals.

The method of homogenizing milk and cream, F. PITTIUS (*Gesundh. Ingen., 1904, p. 254; abs. in Rev. Gén. Lait, 3 (1904), No. 21, p. 502*).—A description of the method of A. Gaulin with remarks on its application and value.

On the manufacture of Ekenberg milk powder, C. J. LUNDSTRÖM (*Nord. Mejeri Tidn., 19 (1904), No. 32. pp. 431, 432*).—This gives a description of the apparatus used in the manufacture of this milk powder and discusses its use.—F. W. WOLL.

Butter investigations, A. HESSE (*Molk. Ztg., 19 (1905), Nos. 2, pp. 25–27; 3, pp. 49–51; 4, pp. 74–76*).—Analyses of 358 samples of salted and 6 samples of unsalted butter from different parts of Mecklenburg are reported. Well-known methods of analysis are outlined and some new modifications are described. The average composition of the salted samples was as follows: Water 12.41, fat 85.04, solids-not-fat 2.56, protein 0.62, milk sugar 0.55, salt 1.29, and ash 0.11 per cent. The average Reichert-Meissl number was 28.38, iodin number 34.61, and Hehner number 88.83.

Brine in dairies from a bacteriological point of view, C. GORINI (*Rev. Gén. Lait, 4 (1904), No. 4, pp. 73–76*).—Mention is made of the isolation of a gas-producing micrococcus from brine used in salting cheese. This organism was found to multiply rapidly in the presence of 20 per cent of sodium chlorid and to retain its vitality for 10 days in bouillon containing 25 per cent of salt. Attention is, therefore, called to the possibility of infecting cheese with injurious bacteria through the brine used. Certain practical suggestions to prevent this, such as the frequent renewing and disinfecting by means of prolonged boiling of the brine, are made.

Influence of water on the preservation of butter in packages, L. MARCAS and C. HUYGE (*Bul. Mens. Off. Renseignements Agr., 4 (1905), No. 2, pp. 151–153*).—Butter wrapped in dry parchment paper remained fresh 8 days longer than the same butter wrapped in moist paper. In the latter case the deterioration of the exterior portion of the butter in contact with the paper was rapid. It is, therefore, believed that paper used in wrapping butter should not be moistened.

Influence of rust on the quality of butter, L. MARCAS and C. HUYGE (*Bul. Mens. Off. Renseignements Agr., 4 (1905), No. 2, pp. 148–151*).—Lactate of iron is formed in milk and cream allowed to remain in rusted cans, and in experimental work butter made from such milk or cream always had a bitter taste.

Sodium fluorid as a butter preservative, A. ANDOUARD (*Bul. Sta. Agron. Loire-Inférieure, 1902–3, pp. 5–12*).—The author's argument is to the effect that sodium fluorid in the amounts used in butter as a preservative is not injurious to health.

Moldy butter tubs and parchment paper, B. BÖGGILD (*Mälkeritid., 17 (1904), No. 27, pp. 483–488*).—A general discussion with suggestions for the prevention of molds.—F. W. WOLL.

Danish butter exports, 1903–4, B. BÖGGILD (*Tidsskr. Landökon., 1904, No. 11, pp. 602–614*).—The gross exports of butter during the year ending September 30, 1904, were 195,429,136 lbs. Danish, and the imports during the same year 43,523,971 lbs. The average price for the year was equivalent to 22 cts. per lb. avoirdupois.—F. W. WOLL.

On the utilization of skim milk at creameries, P. RUNDGREN (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 4, pp. 275–286*).—A comparison of the profitableness of various methods of utilizing skim milk at creameries in Sweden, viz, disposal to patrons, sale for direct consumption, manufacture of cheese, and feeding to calves or pigs is reported. As new methods of utilization, the manufacture of condensed skim milk, manufacture of proton or milk powder, use in soap manufacture and in bread making, etc., are suggested.—F. W. WOLL.

A new preparation for improving skim milk, LÜHRIG (*Molk. Ztg., 19 (1905), No. 6, pp. 121, 122*).—A proprietary preparation advertised for improving skim milk as regards taste and suitability for baking purposes was subjected to analysis,

the results showing that the material contained large quantities of proteids, lecithin, and cholesterin. It was thought that the material was brain or nervous tissue preserved with formalin. Objections to its use are presented.

Some of the relations of casein and paracasein to bases and acids, and their application to Cheddar cheese, L. L. Van Slyke and E. B. Hart (*New York State Sta. Bul. 261, pp. 37*).—In these investigations, which are a continuation and extension of the work reported in Bulletin 214 of the station (E. S. R., 14, p. 607), the authors have studied the relation between milk casein and the salt-soluble compound previously called a casein mono-salt; the relation between the 2 series of compounds previously called casein mono-salts and casein di-salts; and the relation of casein and its derivatives to paracasein and its derivatives. The following compounds have been prepared and studied: Base-free casein, basic calcium casein, neutral calcium casein, casein salts of acids, base-free paracasein, basic calcium paracasein, neutral calcium paracasein, and paracasein salts of acids.

With the omission of headings the results as summarized by the authors follow:

"Preparations of casein free from ash or nearly so were made by precipitating dilute skim milk with acids, removing the acid and inorganic matter by repeated filtration and trituration with water in a mortar. The process required several days.

"Preparations were made with base-free casein, in which the proteid combined with about 2.40 per cent of calcium oxid. One such preparation was made by triturating together calcium carbonate and the base-free casein suspended in water, and another by dissolving base-free casein in limewater and making this neutral to phenolphthalein by acid.

"By treating base-free casein dissolved in limewater with acid until the reaction is almost neutral to litmus, there is formed a compound of casein and calcium oxid containing about 1.50 per cent of calcium oxid.

"Rennet enzym coagulates neither neutral nor basic calcium casein. 'Neutral calcium casein after treatment with rennet is coagulated at ordinary temperatures by soluble calcium salts. Soluble calcium salts, as calcium chlorid, coagulate both neutral and basic calcium casein on warming to 35 to 45° C.

"In its behavior toward soluble lime salts on warming and at ordinary temperatures after treatment with rennet, neutral calcium casein behaves like milk casein, and casein is probably present in cows' milk as the neutral calcium casein.

"A base-free casein, prepared either directly from milk or by treating a limewater solution of free casein with an acid to the point of acidity with litmus, is readily soluble in warm 5 per cent salt solution and in hot 50 per cent alcohol. This body, when freshly prepared and sufficiently warmed is very plastic and ductile. It behaves in all respects like the compound which we were formerly led to regard as a compound formed by combination of casein and an acid and which we regarded as a casein mono-salt of the acid precipitant.

"When 1 gram of base-free casein is treated with about 0.5 cc. of $\frac{n}{10}$ hydrochloric acid, a substance is formed which is insoluble in warm 5 per cent salt solution and in hot 50 per cent alcohol and which is no longer plastic or ductile on warming. This is like the substance usually formed when milk coagulates by natural souring. By treating base-free casein with dilute acid, it was found that 1 gram of base-free casein appears to combine with about 0.5 cc. of $\frac{n}{10}$ hydrochloric acid, forming a casein salt of hydrochloric acid. While the compounds formerly regarded by us as casein mono-salts of acids have been shown by us to be identical with base-free casein, the compounds which we called casein di-salts of acids are compounds formed by combination of acids with free casein.

"A preparation of base-free paracasein was made, and from this dissolved in limewater were prepared (1) basic calcium paracasein, containing in combination about 2.40 per cent of calcium oxid, and (2) neutral calcium paracasein containing about 1.50 per cent of combined calcium oxid.

"Basic calcium casein and paracasein appear soluble in water forming slightly opalescent solutions. Neither is coagulated by rennet, but both are precipitated by soluble calcium salts on warming. Neutral calcium casein is coagulated by soluble calcium salts on warming to 35 to 40° C., but not at ordinary room temperature, while neutral calcium paracasein is completely and quickly coagulated at room temperatures by soluble calcium salts. Free casein and free paracasein, freshly prepared, possess the same solubilities in warm 5 per cent salt solution and in hot 50 per cent alcohol; they also possess the same peculiar properties of plasticity and ductility. The close resemblance of casein and its compounds respectively to paracasein and its compounds suggests that they are chemically alike, paracasein being different only by consisting of a larger molecular aggregation than casein.

"Free paracasein appears to be identical in characteristic properties with the compounds we formerly called paracasein mono-salts of acids used as precipitants. The compounds which we have heretofore called paracasein di-salts of acids appear to be combinations of free paracasein and acids used as precipitants, 1 gram of paracasein uniting, for example, with about 0.5 cc. of decinormal hydrochloric acid.

"From water-extracted fresh Cheddar cheese we prepared one extract by warm 5 per cent salt solution and another by hot 50 per cent alcohol. These preparations have in common with free paracasein the characteristic properties of plasticity, ductility, and the same combining power with bases and acids, and therefore appear to be free paracasein instead of paracasein mono-lactate as we were formerly led to believe.

"When an acid is formed in or added to cows' milk, the acid first combines with the bases of some of the inorganic salts of the milk and then with the calcium that is combined with the casein, resulting in the formation of a precipitate which is free casein. By further formation or addition of acid, the free casein unites with acid, forming a casein salt of the acid, this compound, in the case of lactic acid, being the coagulum familiar in the ordinary souring of milk.

"The coagulum, following the addition of rennet enzym to milk is calcium paracasein, either mixed or loosely combined with soluble calcium salts. While lactic acid is being formed in the process of cheese-making, it combines with the calcium of the calcium paracasein, forming free paracasein and calcium lactate. It is this free paracasein thus formed that is soluble in warm 5 per cent salt solution and in hot 50 per cent alcohol and possesses characteristic properties of plasticity and ductility.

"Much confusion prevails at present in the use of the terms casein and paracasein. It is suggested that the following nomenclature be used: (1) That the compound existing in cows' milk be called calcium casein. (2) That only the free proteid be called casein. (3) That the casein compound containing 2.40 per cent of calcium oxid be called basic calcium casein. (4) That a compound formed by precipitation and combination with an acid be called a casein salt of the acid used. (5) That the same nomenclature be applied to the corresponding paracasein bodies, with the following addition: Calcium paracasein should be applied to the uncoagulated form and the term coagulated calcium paracasein to the coagulated form."

Technical-bacteriological investigations in Emmenthal cheese making, A. Peter (*Landw. Jahrb. Schweiz, 19* (*1905*), *No. 3, pp. 171-181*).—The rate of acid formation in Emmenthal cheese and the use of natural rennet in comparison with artificial rennet with and without the addition of pure cultures of lactic-acid bacteria were studied under practical conditions. On an average of 11 tests the expressed whey at the outset showed 4° Soxhlet, after 2 to 2½ hours 16.6°, and after 5 to 6 hours 45.3°. A rapid increase in acidity was favorable to the production of good cheese. By the use of natural rennet, the desired acidity was secured better than when artificial rennet was used. An objection to the use of natural rennet is the frequent occurrence in it of the gas-producing organism *Bacterium coli communis* and *B. lactis*

aerogenes. It is suggested that in the use of pure cultures such lactic-acid forms should be selected as are favorable to rapid acidification of the fresh cheese.

Canadian Cheddar cheese making, J. G. McMillan (*Jour. Dept. Agr. Victoria, 3 (1905), No. 1, pp. 60–76, pls. 5*).—The principles of Cheddar cheese making are discussed with special reference to conditions in Victoria.

Preparation and ripening of cheese, R. Lezé (*Préparation et maturation des caillés de fromagerie. Paris, 1905; rev. in Rev. Gén. Lait, 4 (1905), No. 8, p. 186*).—This is said to be a very complete general treatise on the subject of cheese making.

Refrigeration in the dairy industry, O. Kasdorf (*Eis und Kälte im Molkereibetrieb. Leipzig: M. Heinsius Nachfolger, 1904, pp. 326, pls. 5, figs. 208*).—This is a very timely treatise on the application of refrigeration to dairying. The author discusses from the standpoint of practice the influence of cold on milk and milk products, construction of ice houses, refrigerating machines, methods of cooling milk, manufacture of ice, cold-storage rooms, special application of cold to milk and some other food products, hygienic handling of milk, refrigerator cars, etc. Typical refrigerator plants are described, data are given on the profitableness of refrigeration, and some trade statistics are cited.

Cooperative dairy societies in Germany (*Indus. Lait.* [*Paris*], *30 (1905), No. 6, pp. 64, 65*).—Statistical data showing the development of cooperative dairying in Germany since 1885 are quoted from a German source. The number of cooperative creameries and cheese factories is reported as having increased from 125 in 1885 to 2,254 in 1903.

Some data on the present condition of the cooperative dairy associations in the Grand Duchy of Mecklenburg-Schwerin, J. Siedel (*Molk. Ztg., 19 (1905), Nos. 8, pp. 169–171; 9, pp. 198–200*).—This is a statistical discussion of the subject.

VETERINARY SCIENCE AND PRACTICE.

Veterinary science and its relation to agriculture, E. W. Hoare (*Vet. Jour., 59 (1904), No. 353, pp. 282–291*).—The author calls attention to the beneficial results obtained from the investigation of animal diseases, particularly anthrax and tuberculosis, and in the regulation of the sale of human food products by means of a scientific meat and milk inspection.

Veterinary memorandum book, J. Signol, P. Cagny, and H. J. Gobert (*Aide-mémoire du vétérinaire. Paris: J. B. Baillière & Sons, 1904, 3. ed., pp. VIII + 688, figs. 328*).—In this volume a vast number of facts are presented in a convenient form relating to matters of importance for veterinarians in ordinary practice. The matters considered in the text include contagious diseases, internal and external pathology, surgery, obstetrics, therapeutics, sanitary police work, inspection of meat, and commercial jurisprudence as related to the purchase and sale of animals.

Laws and general regulations of the sanitary police with regard to domesticated animals (*Ley y reglamento general de policia sanitaria de los animales. Buenos Ayres: Min. Agr., 1904, pp. 119*).—Copies are given of laws regarding the control and eradication of cattle plague, pleuro-pneumonia, foot-and-mouth disease, dourine, rabies, blackleg, anthrax, Texas fever, tuberculosis, and other diseases of animals. Copies are also presented of the regulations regarding the control of animals exported to Uruguay and other foreign countries.

Reports of inspectors of stock for the year ended March 31, 1904, E. Clifton et al. (*New Zealand Dept. Agr. Rpt. 1904, pp. 33–61*).—Detailed reports are made concerning the number and condition of health of various domesticated animals in different parts of New Zealand. Mention is also made of the success attained in the destruction of rabbits and other injurious mammals and notes are given on insect pests, bird nuisances, and related subjects.

Division of veterinary science, J. A. GILRUTH (*New Zealand Dept. Agr. Rpt. 1904, pp. 152–234, pls. 7*).—During the year under report considerable advance has been made in the inspection of meat for home use and export. Statistical notes are given on abattoirs in New Zealand as well as on bacon factories and other details connected with the production and distribution of meat products in a sanitary condition. A brief outline is presented of the work of the division of veterinary science in the inspection of dairies and in giving lectures to stock owners.

A further study was made of contagious mammitis in cows. This disease appears to be distributed nearly throughout New Zealand. It appears under acute, subacute, and chronic forms. In chronic cases 1 or 2 hard nodules are formed within the duct of the affected teat. The disease is due to a specific streptococcus. It may be prevented to some extent by sterilization, at the factories, of the skim milk to be returned to farms. The treatment recommended by the author consists of the application of a 4 per cent solution of boric acid to affected parts of the udder. The injection of this remedy unfortunately diminishes the secretion of milk, but if not continued too long it does not prevent recovery of a nearly normal milk yield. In controlling this disease the author recommends the compulsory notification of all cases, the registration of all dairy herds, and their periodic inspection, as well as sterilization or pasteurization of all milk at the factories.

An account is also presented of contagious abortion and anthrax. Contagious abortion is estimated as causing large annual losses in New Zealand. In spite of the various warnings of the veterinarian regarding anthrax this disease still shows a wide distribution throughout the country. Experiments were undertaken to test the value of lime as a disinfectant for use in combination with infected bone dust, and showed that this substance has no apparent effect upon the bacteria, especially those of anthrax in bone dust, even after prolonged mixture with this fertilizer. The author carried out a long series of experiments in testing the effect of inoculations with virulent anthrax bacilli mixed with *Bacillus coli communis*, streptococci, and *B. enteriditis*. It was shown that guinea pigs, rabbits, and sheep may completely resist the inoculation of large doses of virulent anthrax bacilli provided these organisms are mixed with a large quantity of some other bacterial organisms which are nonpathogenic to these animals. The anthrax bacillus must be mixed with this other organism for, if injected separately under the skin, no resistance is brought about. Mixing cultures of *B. enteriditis* and *B. anthracis* renders the latter harmless to cattle as shown by experiments on calves 6 months old. In later experiments, guinea pigs did not show any definite resistance to the anthrax bacillus when mixed with cultures of *B. enteriditis*.

The author discusses in considerable detail blackleg, hog cholera, and hepatic cirrhosis due to feeding on *Senecio jacobæa*. Notes are given on the symptoms and etiology of blackleg and also on the prevalence of the disease as shown by its occurrence under normal conditions and when controlled by vaccination. Hog cholera has not been detected in New Zealand for the past 2 years. Further experiments with *S. jacobæa* indicate that sheep as well as horses and cattle may become affected by eating this plant. Sheep resist the action of the plant for a much longer period than horses and cattle, but may ultimately succumb. In the execution of meat inspection a number of sheep were noted with yellow meat. This condition was probably due to the effects of *S. jacobæa*.

Brief notes are also given on strangles, dehorning cattle, chronic localized gastritis, tuberculosis in horses, tuberculosis in the skull in cattle, and various cancerous growths in domesticated animals. Statistics were collected dealing with more than 10,000 cows which had been dehorned, and of this number 6,050 were dehorned with the saw. The results were said to justify the operation since no death occurred among the 10,000 animals dehorned.

Blood ferments, A. JOLLES (*München. Med. Wchnschr.*, *51* (*1904*), *No. 47*, *pp. 2083–2087*).—A systematic classification is proposed for the various ferments found in blood. In the group of hydrolytic enzyms the author includes diastase, invertase, lipase, emulsin, and urease. In addition to this group, 4 other groups of ferments in the blood are recognized, viz, autolytic enzyms, coagulation enzyms, oxydases, and katalase. Attention is called to the importance of a study of these various substances in blood in determining the normal, physiological processes in animals, and also the status of pathological conditions. It has been observed that the amount of katalase in the blood is considerably diminished in cases of tuberculosis, nephritis, and carcinoma.

Studies in mammalian tubercle bacilli, III, T. SMITH (*Jour. Med. Research*, *13* (*1905*), *No. 3*, *pp. 253–300*).—This paper contains the results of the author's investigations along this line since 1898 at which time the differentiation of 2 races of tubercle bacilli designated as bovine and human was announced. During this period of 5 years the author's study has served to confirm his original position. Various cultures of tubercle bacilli of human and bovine origin have been studied and their effects upon rabbits and guinea pigs have been tested. Two of the most interesting cultures obtained were from the mesenteric glands of human patients. One of these cultures conformed in all respects to the bovine type, while the other evidently belonged to the human type of the bacilli. The lesions produced by these 2 types of organisms were very similar. Cultures obtained from cats showed some differences in virulence and in morphology. A culture obtained from a dog most closely resembled the human tubercle bacillus.

In inoculation experiments the author found that 3 types of experimental disease occurred in rabbits after inoculation with tubercle bacilli. One form is a rapidly fatal disease produced by bovine bacilli in 2 or 3 weeks and the second form is a milder disease caused by human cultures. In these cases the animals live about 6 months longer than when inoculated with bovine bacilli. An intermediate type also appears, but much more rarely. As a result of the author's extended and careful study of the differences in morphology and virulence observed in tubercle bacilli of various mammalian origin, it is concluded that the conception of the bovine and human type of tubercle bacilli is strongly confirmed. Tubercle bacilli not distinguishable from the bovine type are sometimes found in human beings. The 2 types may be distinguished by the study of their action upon glycerin bouillon. The author believes that mammals other than cattle are probably infected from cattle or man or perhaps from both sources.

Experiments concerning tuberculosis, II, E. A. DE SCHWEINITZ, M. DORSET, and E. C. SCHROEDER (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 52*, *pp. 31–100*, *pls. 26*).—The primary objects of the experiments reported in this part of Bulletin 52 was to determine whether human tubercle bacilli are virulent for cattle, hogs, and monkeys. All cultures used in these experiments were isolated from guinea pigs which had previously been inoculated with material from cases of human and bovine tuberculosis. Detailed clinical notes are given on the cases of human tuberculosis from which material was taken for inoculation. Ten hogs were inoculated with human tuberculous material or pure cultures of the human tubercle bacillus and these 10 animals were compared with another hog which was inoculated with bovine tubercle bacilli. In these experiments it was found that of 3 cultures of tubercle bacilli from children 1 was nonvirulent for hogs while the other 2 produced a generalized tuberculosis quite as severe as that caused by the bovine bacillus, death taking place within from 28 to 60 days.

Cattle were inoculated subcutaneously, intravenously, or intraabdominally and some were fed or drenched with tuberculous material of human origin. Detailed notes were given on each case inoculated by these different methods. No infection was produced by human tubercle bacilli as a result of feeding or drenching, while

the bovine material caused slight lesions. As a result of the inoculation experiments it was found that 25 per cent produced fatal tuberculosis in calves after intravenous inoculation and 33⅓ per cent after subcutaneous inoculation. It appears, therefore, that tubercle bacilli of various degrees of virulence may be obtained from human sources and that some of these bacilli are as virulent as those known to be of bovine origin.

A number of experiments were carried out on monkeys which were inoculated or fed with tubercle bacilli of human or bovine origin. One of the monkeys belonged to the genus Cebus, 2 to the genus Rhesus, and 4 were baboons. The results obtained from these experiments indicate that there is no important difference between human and bovine tubercle bacilli. It was shown to be possible to infect monkeys with bovine tubercle bacilli when received with their food. Since monkeys are most closely related to man of all animals these experiments indicate the desirability of taking every reasonable precaution against the use of tuberculous milk and of adopting measures which will eventually eliminate all tuberculous cows from dairy herds. The authors believe, as a result of their experiments, that although there are certain differences between bovine and human tubercle bacilli there "is not a specific difference or even a difference which permits the grouping of the germs as distinct varieties of the same species." A review is presented of some of the more recent experiments concerning the intertransmissibility of human and bovine tuberculosis in connection with a brief bibliography of the subject.

Immunization of cattle against tuberculosis and experiments in combating the disease by means of serum, F. F. Friedmann (*Deut. Med. Wchnschr., 30 (1904), No. 46, pp. 1673–1675*).—The author has already reported experiments concerning the effect upon cattle and other animals of tubercle bacilli obtained from turtles. It was found in a series of experiments carried out for the purpose of determining the effect of tubercle bacilli from turtles that these organisms when introduced into cattle, guinea pigs, and other animals produce protective substances in inoculated animals to such an extent that these animals remain immune against future doses of virulent tubercle bacilli of bovine origin. A complete recovery took place in treated animals after inoculation with virulent cultures. The lesions produced were only slight and soon yield under the influence of repeated inoculations with tubercle bacilli from turtles. Tubercle bacilli obtained from these animals appear to possess certain advantages over those obtained from any other source. When human tubercle bacilli were used for immunizing cattle the effects of such inoculations are noticeable for several months in the form of definite tuberculous lesions. It is found possible with tubercle bacilli from turtles to produce immunity to tuberculosis by a single inoculation. The serum of animals thus treated was also found to possess considerable protective power when used for inoculating other animals, and this fact is considered of great importance in view of the slight success which has thus far been had in treating tuberculosis by the serum method.

The effect of tuberculosis vaccination upon cattle infected with tuberculosis, L. Pearson and S. H. Gilliland (*Reprinted from Univ. Pennsylvania Med. Bul., 18 (1905), No. 2, pp. 30–35, figs. 12*).—During the past two years the authors have tested the effect of vaccination upon young cattle infected with tuberculosis. In these experiments 12 calves, 6 to 8 months of age, were used and were divided into 3 groups, all of which received the same feed and general attention. The 3 calves in one group received 7 intravenous injections of human tubercle bacilli in doses varying from 1 cc. to 6 cc. and at intervals from 6 to 20 days. A final injection of 5 cc. was given about 1 year later. The 3 calves of the second group received subcutaneous injections of tuberculin at intervals of 2 to 10 days, alternating with intravenous injections of human tubercle bacilli. The third group of 6 calves received no treatment. Two of the control calves died and the rest of the animals were killed and examined.

Detailed notes are given on the post-mortem findings in each of these animals, and

from material thus obtained cultures were made of tubercle bacilli, and guinea pigs were inoculated. A decided difference was observed between the treated and untreated calves. The vaccination treatment had the effect of checking the progress of tuberculous lesions and also of causing a distinct retrogression in these lesions. The tuberculous foci in treated animals were strongly encapsulated, although they contained living tubercle bacilli. It is believed, however, that such bacilli would never have escaped from the capsules. The treatment is believed, therefore, to have had a distinct curative effect. The authors considered it uncertain what would be the effect of this treatment upon older animals.

The cure and prevention of bovine tuberculosis—subcutaneous injections of oil, T. B. KEYES (*Amer. Vet. Rev., 28 (1904), No. 5, pp. 419–431*).—The author presents a discussion of his method of treating human tuberculosis by means of injections of olive oil. The oil is used in a pure and thoroughly sterilized condition. It is believed that the same method may be profitably employed in treating tuberculosis in domesticated animals.

Tuberculosis as the chief defect in food animals, PLATH and J. KEUTEN (*Ztschr. Fleisch- u. Milchhyg., 15 (1904), No. 2, pp. 33–38*).—The purpose and meaning of the German imperial meat inspection laws regarding the method of procedure with tuberculous meat are briefly discussed. Attention is called to the desirability of possessing regulations which are as detailed as possible regarding the extent of tuberculous infection which renders necessary a total condemnation of the carcasses.

Bovine tuberculosis, V. A. MOORE (*New York Cornell Sta. Bul. 225, pp. 77–92, figs. 8*).—In this bulletin a general, popular account is presented of the cause, methods of infection, period of incubation, course, detection, and prevention of tuberculosis. The approved methods of eradicating tuberculosis from a herd are described in some detail.

Avian tuberculosis in its relation to mammalian tuberculosis, LYDIA RABINOWITSCH (*Deut. Med. Wchnschr., 30 (1904), No. 46, pp. 1675–1678*).—The literature relating to this controversy is briefly reviewed. The author made post-mortem examinations on 200 birds and found tuberculous lesions in 55 of this number. Experiments were carried out not only on the tuberculosis of domestic fowls and pigeons, but also on this disease in various species of birds during which 34 distinct cultures were employed. Apparently, according to the author's observations, the danger of transmission of tuberculosis in birds from close association is very slight. Attention is called to the possibility of infection of fowls through the egg. The author undertook experiments to gain information on this subject. During these experiments 32 eggs were inoculated with tubercle bacilli from different sources and from this number of eggs only 8 chickens were hatched. About 90 per cent of the embryos in the eggs inoculated with avian tubercle bacilli failed to hatch, 70 per cent in those inoculated with human bacilli, and 40 per cent in those inoculated with bovine bacilli. The avian bacilli were therefore considerably more virulent in these cases than the mammalian form of the organism. The author believes as a result of her investigations that avian tuberculosis is identical with the bovine form of the disease.

Tuberculosis in ducks, W. E. KING (*Amer. Vet. Rev., 28 (1904), No. 4, pp. 361–363*).—Brief notes are presented on the symptoms and relative frequency of tuberculosis in chickens and ducks. In an outbreak of this disease an examination was made of various organs from affected ducks and a micro-organism was obtained which closely resembled that which was observed in chickens affected with tuberculosis.

Pseudotuberculosis in buffaloes, A. PADRONE (*Gior. R. Soc. Accad. Vet. Ital., 53 (1904), No. 43, pp. 1009, 1010*).—Pseudotuberculosis was observed in a buffalo which was killed for meat and which came under inspection at an abattoir. The disease affected chiefly the lungs. From the pathological tissue cocci and diplococci were obtained.

Spore formation in anthrax and other spore-bearing bacteria, SELTER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), Nos. 2, pp. 186–193; 3, pp. 381–389*).—The literature relating to the conditions under which spore formation takes place in anthrax bacilli is briefly reviewed. In his experiments the author used a number of cultures of anthrax bacilli, one of which had lost the power of forming spores and had to be discarded on this account. It was shown during the course of the experiments that glycerin and grape sugar in 5 per cent and 2 per cent solutions respectively exercise a checking influence upon the development of spores. The effect of sera upon the spore formation in the anthrax bacilli was also tested. For this purpose the serum of horses and goats was used. Spore formation took place even in undiluted serum, but was somewhat more rapid in serum after dilution. When the anthrax bacillus was cultivated on solid media it was found that the power of producing spores was lost after 3 generations on glycerin agar. It appears, therefore, that in the case of solid media a 3 to 5 per cent addition of glycerin unfavorably influences the process of spore formation. Notes are also given on the formation of spores in the hay bacillus, the bacillus of malignant edema, blackleg, tetanus, and *Bacillus botulinus*. The author concludes from his experiments that the most favorable media for encouraging a luxuriant production of spores in aerobic bacteria are simply bouillon and agar or these media with the addition of 2 per cent of milk sugar. The addition of 5 per cent of glycerin does not check the development of spores to the same extent as 2 per cent of grape sugar. Nonspore-bearing races of anthrax bacilli may be readily obtained by repeated transfers upon glycerin agar. Spore formation takes place in the absence of suitable nutritive conditions only when the bacilli are in the height of their developmental powers. The spores in anthrax bacillus are formed by the contraction of the protoplasm. The more oxygen present the more rapid the spore formation, and this process does not take place in the complete absence of oxygen. The juice of the quince and marshmallow can not replace oxygen. Spore formation in aerobic bacteria is favored by the addition of grape sugar and glycerin.

The acclimatization of anthrax bacilli to the bactericidal action of the serum, G. SACHAROFF (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), No. 3, pp. 411–418*).—The experiments reported by the author in this paper were largely concerned with determining whether the anthrax bacillus could become immune to a bactericidal serum in a manner similar to that which has been observed in other bacteria. For this purpose the author made use of virulent laboratory cultures rather than vaccine. Anthrax bacilli were cultivated in rabbit blood and in fresh rabbit serum. The author's experiments showed that little hope is to be entertained of immunizing anthrax bacilli toward the bactericidal effect of defibrinated rabbit blood. No acclimatization was noted in this regard after 6 transfers. When rabbit serum was substituted for rabbit blood, however, and 8 transfers of anthrax cultures were made, rather different results were obtained. It was thus found possible to immunize anthrax bacilli toward the bactericidal action of rabbit serum, but not toward that of defibrinated blood. This acquired immunity toward serum is easily lost by preservation of the cultures in an autoclave or at the temperature of an ordinary living room. No increase in virulence was observed in the bacilli which had become immune to rabbit serum.

Sterilization of oats infected with anthrax, A. JAEGER (*Monatsh. Prakt. Tierh., 16 (1904), No. 4–5, pp. 232–235*).—The author has continued his experiments in perfecting methods of destroying anthrax spores in oats without greatly injuring the market or nutritive value of the oats. During these experiments it was found that a temperature of 180° C. for a period of 12 minutes was sufficient to destroy anthrax spores in a layer of oats 2 cm. deep. The oats, however, were considerably roasted by subjection to this temperature, and were, therefore, greatly reduced in market value. By the use of Venuleth's apparatus it was found possible to subject the oats

to a sufficiently high temperature to destroy anthrax spores within 12 minutes without roasting the oats. The color of the oats was slightly darkened, but they were still yellow and marketable. Chemical analyses showed that their nutritive value was not affected.

Oxygen in milk fever, E. H. Lehnert (*Connecticut Storrs Sta. Rpt. 1904, p. 147*).—Oxygen was injected into the udder in one case of milk fever. The symptoms were relieved within 20 minutes and apparent recovery took place within a few hours. After 16 days the normal milk flow returned.

Treatment of parturient paresis, W. H. Ridge (*Amer. Vet. Rev., 28 (1904), No. 2, pp. 124–127*).—The author briefly outlines a considerable variety of treatments adopted by different veterinarians in curing this disease. The author tested the oxygen treatment in 4 cases, all of which recovered promptly and without any complications. During the same period 31 cases of milk fever were treated by the Schmidt method, and among this number 18 recovered while 13 died. Attention is called to the promptness with which the effects of oxygen injections are manifested. The animals rapidly regain consciousness and give no trouble to the attendants. A brief description is given of a suitable oxygen tank for use in this treatment.

The use of oxygen for milk fever, R. P. Lyman (*Amer. Vet. Rev., 28 (1904), No. 3, pp. 256–262*).—The author has had nothing but excellent results in the use of this method. In acute cases of milk fever where unconsiousness has already supervened, the author administers strychnin hypodermically in doses of $\frac{3}{8}$ of a grain. The udder is then hastily inflated with oxygen. Usually the effects of the oxygen are noticeable very rapidly, sometimes within 10 minutes, and the most serious symptoms of the disease are frequently relieved in 35 minutes. A plethoric condition is considered by the author as the most important predisposing cause of this disease. The exact etiology of milk fever, however, still remains in doubt. The author uses an oxygen tank under considerable pressure, and the method requires the assistance of an attendant.

Parturient apoplexy—more results from oxygen, S. S. Snyder (*Amer. Vet. Rev., 28 (1904), No. 3, pp. 269, 270*).—Detailed clinical notes are given on 9 cases of milk fever treated by means of oxygen in 8 of which a complete recovery took place, while 1 animal died. The results of the inflation of the udder by means of oxygen were manifested within a short time.

Oxygen in the treatment of parturient paresis, J. Miller (*Amer. Vet. Rev., 28 (1904), No. 4, pp. 368–370*).—A report is given on the clinical symptoms and course of the disease in 5 cases of milk fever treated by means of oxygen. A recovery took place in all cases within comparatively short time. The author gives a brief description of the oxygen tank used in these treatments. It is believed by the author that the disease is due to the toxic products of an anaerobic organism.

The bacterial flora of the healthy genital canal of cattle and its importance in the production of puerperal fever, B. Denzler (*Monatsh. Prakt. Tierh., 16 (1904), No. 4–5, pp. 145–195*).—An elaborate investigation was made for the purpose of determining the species of bacteria found in various parts of the genital canal in cattle. The literature relating to this subject is critically discussed in connection with a short bibliography. The author's investigations were made on a large number of cattle both before and after death. Particular attention was given to studying the extent to which the vaginal walls are capable of destroying pathogenic and other bacteria. As a result of the author's investigations it appears that the bacterial flora of the vulva of cattle varies greatly, but frequently includes pathogenic microorganisms such as *Staphylococcus pyogenes aureus*, streptococcus, and the coli bacillus. With the exception of the coli bacillus, however, these organisms show a much reduced virulence. Under normal conditions no pathogenic bacteria are found in the vagina and even in abnormal conditions the cervical canal, the uterus, and the oviducts are free from bacteria. The bactericidal power of the vaginal walls in cattle

is quite striking. The natural process of purification requires only a short time, usually varying from 18 to 117 hours. The process of disinfection is apparently not greatly assisted by the use of antiseptic washes. The introduction of highly virulent staphylococci, streptococci, and coli bacillus into the vagina of cattle has no apparent effect upon the health of the animals.

Treatment of infectious vaginal catarrh in cattle, MARTENS (*Berlin. Tierärztl. Wchnschr., 1904, No. 47, pp. 769, 770*).—The symptoms of this disease are briefly described. When the proper method of treatment is adopted it is possible, in the author's opinion, to bring about a cure within 2 or 3 weeks. Medicines used in the treatment of this disease may be applied in the form of a powder, salve, or fluid. The last-named method of procedure is probably to be preferred in a majority of cases. It permits a more thorough application of the remedy to all of the affected surfaces. For this purpose the author uses a 6 to 8 per cent solution of crude alum and tannin in warm water. After a preliminary treatment with this remedy Ichthargan salve may be applied.

Premature parturition in cattle, A. S. ALEXANDER (*Breeder's Gaz., 46 (1904), No. 20, pp. 892, 893*).—This disease occurs in an accidental and a contagious form. Particular attention is given to a discussion of contagious abortion and detailed recommendations are made regarding the care of aborting animals, disinfection of stables, and general methods to be adopted for the prevention and eradication of the disease.

An investigation in the County of Wexford of a disease in young cattle, J. H. NORRIS (*Jour. Dept. Agr. and Tech. Instr. Ireland, 5 (1904), No. 1, pp. 48–57, pls. 9, map 1*).—For a number of years a serious loss of cattle has been experienced in various parts of Ireland from a chronic wasting disease characterized by great anemia and very high mortality. During the past winter the mortality was higher than usual, owing perhaps to the wet season. In the County of Wexford the disease invaded almost every district. Affected cattle are recognized by their hidebound condition, anemic appearance, and scours. A great majority of outbreaks occur between October and April, but occasionally cases are met with in the spring and early summer. Although the affected animal gradually loses weight and shows an anemic condition the appetite frequently remains unimpaired. When a post-mortem examination is made it is found that the first 3 stomachs and the majority of the other internal organs are in a nearly normal condition except for their bloodless appearance. It is apparent from such an investigation that no organic disease prevails in the affected animals. In every post-mortem examination, however, myriads of parasitic worms were found belonging to the species *Strongylus gracilis*. The parasites are uniformly found in the fourth stomach, the condition of which when examined post mortem varies to a considerable extent. In some cases it shows a catarrhal condition with a color varying from rose to purple. In other cases, it is pale with swollen, soft, and dropsical walls. In a few instances another parasitic worm, *S. convolutus*, is found in company with *S. gracilis* and occasionally a species of trichocephalus was found in the stomach. The life history of *S. gracilis* is not well understood and the disease caused by its presence in the fourth stomach does not readily yield to treatment. In order to prevent the general spread of infestation it is recommended that various measures be adopted which are calculated to destroy the larvæ in the pasture. With this object in view, the manure from infested cattle should be burned or buried in quicklime and the worms on the grass and pastures may be destroyed to some extent by treatment with lime or salt. Badly infested pastures may be used for horse grazing or planted to cultivated crops. In this way the larvæ in pastures may be greatly reduced in numbers.

Generalized melanosis in a heifer, E. BRU (*Rev. Vét. Toulouse, 29 (1904), No. 12, pp. 812, 813*).—In a heifer which was apparently in good health and which showed no emaciation or general physiological disturbance aside from melanosis, the spinal

cord was found to be of a black color throughout with extension of this pathological condition into the nerves for some distance from the spinal cord. The brain membranes were thickened and covered with a dark-colored fluid.

Lead poisoning of cattle, R. H. FORBES and W. W. SKINNER (*Arizona Sta. Rpt. 1904, pp. 497, 498*).—Numerous fatalities occurred among cattle after drinking water from the tailings of a quartz stamp mill. An analysis of this water showed a faint trace of arsenic, somewhat more copper, and 2.64 to 3.21 per cent of lead in the form of white carbonate. The symptoms observed in the poisoned animals were those which are produced by lead, and it is believed that the carbonate of lead was the cause of death.

Malignant edema, V. SCHAEFER (*Amer. Vet. Rev., 28 (1904), No. 4, pp. 364–367*).—An outbreak of this disease occurred on a farm near Herman, Nebr., and affected both horses and cattle. Large edematous swellings were observed on the anterior portion of the thorax. Affected horses were treated with iron and quinin, but died within the course of 2 days. Several years later an outbreak of the disease occurred in the same locality among cattle. The swellings on affected cattle were of large size. The author tried potassium iodid in half-ounce doses 3 times daily and made external applications of corrosive sublimate. The doses of potassium iodid were increased and maintained for a number of days. After a time symptoms of iodism appeared, after which the treatment was omitted for 2 or 3 days. The remedy was then applied again and continued until complete recovery took place.

The bacillus of malignant edema, E. BACHMANN (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37 (1904), Nos. 2, pp. 221–228; 3, pp. 353–364*).—A careful study was made of the morphology, biology, and pathogenic properties of the bacillus of malignant edema. During the author's experiments a number of races of this organism were used in inoculating guinea pigs and rabbits. For this purpose cultures were maintained on agar and liquefied gelatin. The 5 races of the bacillus which were used by the author would naturally be classified in 2 groups containing 3 and 2 races, respectively. The first group when inoculated into rabbits and guinea pigs produced sera which agglutinated bacilli of the same race and which also possessed a weak agglutinating power toward other races of the same group. In the races belonging to the second group no pronounced agglutinating serum was obtained during the author's experiments. It is believed that the ordinary bacillus of malignant edema and the bacillus described by Ghon and Sachs are identical and the term bacillus of malignant edema is, therefore, retained as a group name.

Etiology and treatment of azoturia, B. M. FLINT (*Amer. Vet. Rev., 28 (1904), No. 2, pp. 146, 147*).—Brief notes are given on the symptoms of this disease. In treating azoturia the author administers eserin or arecolin, followed by a mixture containing fluid extract of jaborandi, fluid extract of buchu, sweet spirits of niter, and cold water. The fluid extract of jaborandi is considered a drug of great value in combating the symptoms of azoturia.

Diseases of sheep in Great Britain (*Jour. Bd. Agr. [London], 11 (1904), No. 8, pp. 490–494*).—During the spring of 1904 reports were received by the board of agriculture which indicated that sheep diseases were perhaps unusually prevalent on account of the previous wet season. A circular letter of inquiry was, therefore, addressed to a number of correspondents and replies were received from which considerable information was gained regarding the nature and prevalence of sheep diseases. In general, the health of sheep was found to be in fairly satisfactory condition. The death rate in most of the localities was not above the average. Notes are given on the occurrence of liver fluke, foot rot, louping ill, blackleg, scour, and joint ill. In the replies to the circular letter it was stated that in some localities scour is very fatal and widely distributed in certain seasons.

Treatment of petechial fever with Ichthargan, BRÜGGER (*Deut. Tierärztl. Wchnschr., 12 (1904), No. 47, pp. 470–472*).—The symptoms and course of a case of this disease in the horse are described in considerable detail. A 2 per cent solution of

Ichthargan was administered intravenously. The symptoms of the disease recurred, however, after apparent recovery had taken place. Another intravenous inoculation was given and subsequently a third after another recurrence of the symptoms. At the third injection a 4 per cent solution of Ichthargan was given and the usual reaction was exhibited within 10 minutes. A complete recovery took place.

Ichthargan, A. Höijer (*Finsk Veterinärtidskr., 10 (1904), No. 4, pp. 79–85*).—The chemical nature of this drug is briefly discussed. The author used Ichthargan in the treatment of suppurating wounds, eczema in dogs, and also in cases of mange and infestation with lice. Satisfactory results were obtained in nearly all cases.

Epizootic cerebro-spinal meningitis in horses, Huber (*Wchnschr. Tierheilk. u. Viehzucht, 48 (1904), No. 44, pp. 693–695*).—This disease broke out among 6 horses on a farm. The symptoms of the disease are briefly outlined. An examination of the premises showed that the sanitary conditions were very poor. The stalls were, therefore, rebuilt and a thorough disinfection was carried out on the premises. Notwithstanding these precautions, however, another case occurred after a period of 2 months and this case did not yield to treatment.

Glucose in the urine in cases of dourine, J. Roger (*Rev. Vét. Toulouse, 29 (1904), No. 12, pp. 813, 814*).—The author determined the presence of an unusual amount of glucose in the urine of a stallion which was affected with dourine. The glucose varied in quantity from 2 gm. to 10 gm. per liter. The presence of glucose in the urine appeared to be correlated with the loss of weight which was gradually taking place in the affected stallion. This discovery may be of some assistance in diagnosing dourine.

Dourine and surra, H. T. Pease (*Vet. Jour., 59 (1904), No. 353, pp. 297–299*).—The Asiatic buffalo was inoculated with virulent blood from a case of dourine and a secondary swelling was obtained at the point of inoculation at which place also the virulent organism was found. Detailed notes are given on one case of this sort.

The dangers which are inherent in a system proposed by Brauer for raising animals immune to surra, A. Schmidt (*Berlin. Tierärztl. Wchnschr., 1904, No. 47, pp. 767, 768*).—Brauer, on the basis of his observations of diseases caused by trypanosomes in tropical countries, suggested that the most efficient way of obtaining animals immune to these diseases was to subject them during early life to the attacks of *Glossina morsitans* in the presence of other animals affected with the disease. The author calls attention to the danger that such animals, during the course of immunization, may transmit the disease to adult animals which in turn may be affected with fatal cases. The scheme proposed by Brauer is considered as subject to many objections, particularly in view of the great difficulties involved in establishing any new system of animal industry among the natives in tropical countries.

Leucocytes in the blood of the horse, Bibault (*Bul. Soc. Cent. Méd. Vét., 81 (1904), No. 20, pp. 671–677*).—An elaborate study was made of the various forms of leucocytes found in the blood of the horse and tables are presented showing the relative numbers of these different leucocytes in horses of different age in health and also under the influence of various diseases. It was found that mallein injections caused a hyperleucocytosis in horses which were not glanderous. The polynuclear cells underwent the greatest increase in numbers. An examination of the blood of glanderous horses showed that the number of polynuclear cells was considerably above the normal and mallein injections were found to exaggerate this normal condition to a great extent.

Poultry diseases, A. R. Ward (*California Sta. Rpt. 1904, pp. 90–107, fig. 1*).—A brief account is given of the extent of the poultry business in California and of the recent establishment of the poultry experiment station at Petaluma. At this station a study is being made of various poultry diseases, including tuberculosis, fowl cholera, chicken pox, and roup. Tuberculosis appears not to be transmitted through the eggs, in fact, hens with advanced cases of tuberculosis do not lay. Sanitary measures when carried out strictly are capable of reducing the losses from fowl cholera to a material extent. These measures include the collection and destruction of all dead

birds and thorough spraying of poultry houses. In a study of roup numerous remedies were tried, including potassium permanganate, creolin, kerosene, camphor, turpentine, etc. While the permanganate of potash was found useful in combating the disease in the eyes, it appeared to be useless in treating the nasal chambers. The same statement may be made for creolin. Copper sulphate in a 2 per cent solution and turpentine were of little avail. Kerosene gave encouraging results, but the fowls which were apparently cured subsequently died. Brief notes were also given on anthrax and "mad itch" in cattle.

The saliva of rabid animals and the vaccination of sheep against rabies, P. Remlinger (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 29, pp. 309–311*).—For the purpose of testing the virulence of saliva of rabid animals inoculations with pilocarpin were given. This drug has the power of causing an abundant secretion of saliva. It was thus found possible to collect the saliva under aseptic condition. Saliva thus obtained from different animals was inoculated into rabbits, guinea pigs, and other experimental animals in considerable numbers. No case of rabies resulted. When a large quantity of such saliva was used in inoculation experiments it had no effect in producing immunity toward rabies in the inoculated animals.

Recent work on rabies, P. Remlinger (*Bul. Inst. Pasteur, 2* (*1904*), *Nos. 19, pp. 753–764; 20, pp. 793–806*).—An outline is presented of results obtained by investigations of various phases of rabies. Notes are given on the methods of penetration of rabies virus into susceptible animals, the rabies corpuscles of Negri, filtration of rabies virus, rabies toxin, Pasteur treatment for the disease, and symptoms, diagnosis, and pathological anatomy of rabies. A brief criticism is also given of the theory of Sinn regarding the attenuating effect of dogs and other carnivorous animals upon rabies virus.

Negri's corpuscle and the rapid diagnosis of rabies, P. Stazzi (*Clin. Vet., 27* (*1904*), *Nos. 42, pp. 249–254; 44, pp. 261–265; 46, pp. 273–277*).—During the course of the author's investigations it was found possible to recognize Negri's corpuscles with considerable ease, and to make a comparatively rapid diagnosis of rabies. The occurrence of these corpuscles and pathological alterations in the surrounding tissue are briefly described. The literature of the subject is discussed in connection with a short bibliography.

Immunity in cases of piroplasmosis in dogs, A. Theiler (*Centbl. Bakt. u. Par., 1. Abt., Orig., 37* (*1904*), *No. 3, pp. 401–405*).—Dogs which have resisted an attack of piroplasmosis remain permanently immune to the disease thereafter. The organism of the disease, however, is always found in their blood, which remains virulent for susceptible dogs. Experiments were made by the author for the purpose of determining whether dogs could be overimmunized, so as to obtain sera with preventive action toward the development of piroplasmosis. During these experiments it was found that the serum obtained by overimmunizing dogs with the defibrinated blood of sick animals possesses considerable preventive action. The blood of an overimmunized dog has a pathogenic effect whether defibrinated or not. The serum of treated dogs contains a preventive substance which is not destroyed by subjection to a temperature of 55° C. The mechanism of the production of a preventive serum in immune dogs appears to take place according to the same laws which are concerned in the process of immunization by means of bacteria. The only essential difference consists in the fact that the blood of highly immune dogs remains virulent.

Variation in the hooks of the dog tapeworms, Taenia serrata and T. serialis, E. C. Stevenson and C. C. Engberg (*Studies Zool. Lab., Univ. Nebraska, No. 59, pp. 409–448, pls. 6*).—This article was prepared as a thesis for submission at the University of Nebraska. The material was collected chiefly from dogs in the vicinity of Lincoln, Nebraska. The authors studied the position and attachment of the hooks of both species of tapeworms and gave attention also to the investigation of the function of the hooks, the variation in size and shape, and the life history of

T. serrata and *T. serialis*. The average length of the hooks of both species of tapeworms as found in dogs at Lincoln, Nebr., is considerably greater than that hitherto reported. The literature of the subject is discussed in connection with a brief bibliography.

Vaccination against fowl cholera by means of its toxins, C. BISANTI (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 28, pp. 293-295*).—In a series of experiments carried out by the author it was found possible to confer immunity toward fowl cholera upon susceptible animals by means of cultures of the fowl cholera bacilli in vivo in collodion sacs. By allowing such cultures in collodion sacs to remain in the peritoneum where their effects are most actively manifested an immunity is produced which is much more effective and lasting than may be secured by hypodermic inoculation.

Index-catalogue of medical and veterinary zoology, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pts. 9, pp. 661-706; 10, pp. 707-782; 11, pp. 783-838*).—In these parts of the index-catalogue all authors have been entered whose names begin with H, I, and J.

AGRICULTURAL ENGINEERING.

Contributions to the hydrology of eastern United States, 1904, M. L. FULLER (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 110, pp. 211, pls. 5, figs. 33*).—"The present paper, which is the second of the series of 'Contributions to the hydrology of eastern United States,' includes 23 short reports by 19 geologists and others. Of these the longer papers have been contributed by those connected with the eastern section of the division of hydrology, but several that embody summaries of the water resources of regions covered by geologic investigations have been prepared by members of the geologic branch."

The papers included are: Description of the Underflow Meter used in Measuring the Velocity and Direction of Underground Water, by C. S. Slichter; The California or "Stove-Pipe" Method of Well Construction, by C. S. Slichter; Approximate Methods of Measuring the Yield of Flowing Wells, by C. S. Slichter; Corrections Necessary in Accurate Determinations of Flow from Vertical Well Casings, by A. N. Talbot; Experiment Relating to Problems of Well Contamination at Quitman, Ga., by S. W. McCallie; The New Artesian Water Supply at Ithaca, N. Y., by F. L. Whitney; Drilled Wells of the Triassic Area of the Connecticut Valley, by W. H. C. Pynchon; Triassic Rocks of the Connecticut Valley as a Source of Water Supply, by M. L. Fuller; Spring System of the Decaturville Dome, Camden County, Mo., by E. M. Shepard; Water Resources of the Fort Ticonderoga Quadrangle, Vermont and New York, by T. N. Dale; Water Resources of the Taconic Quadrangle, New York, Massachusetts, and Vermont, by F. B. Taylor; Water Resources of the Watkins Quadrangle, New York, by R. S. Tarr; Water Resources of the Central and Southwestern Highlands of New Jersey, by L. LaForge; Water Resources of the Chambersburg and Mercersburg Quadrangles, Pennsylvania, by G. W. Stose; Water Resources of the Curwensville, Patton, Ebensburg, and Barnesboro Quadrangles, Pennsylvania, by F. G. Clapp; Water Resources of the Elders Ridge Quadrangle, Pennsylvania, by R. W. Stone; Water Resources of the Waynesburg Quadrangle, Pennsylvania, by R. W. Stone; Water Resources of the Accident and Grantsville Quadrangles, Maryland, by G. C. Martin; Water Resources of the Frostburg and Flintstone Quadrangles, Maryland and West Virginia, by G. C. Martin; Water Resources of the Cowee and Pisgah Quadrangles, North Carolina, by H. S. Gale; Water Resources of the Middlesboro-Harlan Region of Southeastern Kentucky, by G. H. Ashley; Summary of the Water Supply of the Ozark Region in Northern Arkansas, by G. I. Adams; and Notes on the Hydrology of Cuba, by M. L. Fuller.

Hydrography of the Susquehanna River drainage basin, J. C. HOYT and R. H. ANDERSON (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 109, pp. 215, pls. 29, figs. 9*).—"In this paper has been brought together, in such form as to be of

use to both the general and the engineering public, all the available hydrographic information in regard to this important area."

Irrigation in the Karroo, P. J. Du Toit (*Agr. Jour. Cape Good Hope, 26 (1905), No. 1, pp. 62–68*).—Descriptions are given of successful and unsuccessful schemes, especially those along the Visch, Zak, and Orange rivers. The unsuccessful schemes include those in which flood water is conserved in a large dam and led on to land below the wall; the successful schemes include those in which flood waters are impeded in their course and spread over the land above the wall, and those in which irrigation is done by diversion from perennial streams. The first are largely government enterprises; the second mainly private; the third both public and private.

The utilization of Karroo flood waters (*Agr. Jour. Cape Good Hope, 26 (1905), No. 1, pp. 88–100, pls. 2, figs. 7*).—The work and methods used on a large farm near Schoombie to divert and spread flood waters over the land are described and the results of the practice are discussed.

Land treatment of sewage: I. General report, G. McGowan, A. C. Houston, and G. B. Kershaw. **II. Chemical report,** G. McGowan. **III. Bacteriological report,** A. C. Houston. **IV. Engineering and practical report,** G. B. Kershaw (*Roy. Com. Sewage Disposal [Great Britain] Rpt., 4 (1904), pts. 1, pp. 116, dgms. 18; 2, pp. IV+328, dgms. 40; 3, pp. 214, pls. 4, dgms. 18; 4, pp. 120, dgms. 53*).—This report gives the results of a general inspection and detailed observations on 8 representative sewage farms by the Royal Commission on Sewage Disposal. The 8 farms were classified and studied according to the type of soil employed, 7 fairly representative soils being included as follows: Sand, sand and gravel, light loam, heavy loam, clay, peat, and chalk. The data recorded relate to situation, size, and irrigated area of the farms; the population supplying the sewage; amount, dry-weather flow, character, and method of treatment of the sewage; character of soil and subsoil; length of time the farm has been in operation; the method of handling the sewage and disposing of the effluents; chemical and bacteriological examinations of the sewage and effluents; mechanical analyses of the soils and subsoils of the farms, etc.

The report also reviews previous work of the Rivers Pollution Commission in its bearing upon this subject. Data are given in detail in numerous tables and are shown graphically in colored diagrams.

The more important points brought out in the report are summarized as follows:

"In the first place, the best kind of soil for filtration purposes (e. g., light sandy loam overlying gravel and sand) can certainly purify to a remarkable extent, at the rate of 23,000 gals. of a strong mixed sewage per acre per 24 hours (a) at a given time; and over 10,000 gals. per acre per 24 hours (b) on the year's working of the total irrigable area. Further, under (a) and (b) sets of conditions, over 100,000 and over 30,000 gals., respectively, of a rather weak sewage can be purified to a fair although not to an altogether satisfactory extent.

"Secondly, with soil less well suited for filtration purposes (e. g., sand and partially peaty soil lying upon sand and gravel), from about 25,000 to 46,000 gals. of sewage per acre per 24 hours (a) at a given time; and from about 8,000 to 23,000 gals. per acre per 24 hours (b) on the year's working of the total irrigable area, can be treated so as to yield effluents fairly good, but, on the whole, not quite satisfactory.

"Thirdly, with soils passing from gravelly loam to heavy loam or clay, all being worked as combined surface irrigation and filtration farms, from about 12,000 to 57,000 gals. of sewage per acre per 24 hours (a) at a given time; and from about 4,000 to 9,000 gals. per acre per 24 hours (b) on the year's working of the total irrigable area can be treated so as to yield effluents moderately good, but still not altogether satisfactory.

"To summarize all the results within the limits of a few sentences is impossible, but we may say in conclusion, and speaking in general terms, that we doubt whether even the most suitable kind of soil worked as a filtration farm should be called upon

to treat more than 30,000 to 60,000 gals. per acre per 24 hours at a given time (750 to 1,500 persons per acre); or more than 10,000 to 20,000 gals. per acre per 24 hours, calculated on the total irrigable area (250 to 500 persons per acre). Further, that soil not well suited for purification purposes, worked as a surface irrigation or as a combined surface irrigation and filtration farm, should not be called upon to treat more than 5,000 to 10,000 gals. per acre per 24 hours at a given time (125 to 250 persons per acre); or more than 1,000 to 2,000 gals. per acre per 24 hours, calculated on the total irrigable area (25 to 50 persons per acre). It is doubtful if the very worst kinds of soil are capable of dealing quite satisfactorily even with this relatively small volume of sewage. The population per acre is calculated on 40 gals. of sewage per head per day. It is here assumed that the sewage is of medium strength, and is mechanically settled before going on to the land."

The commission further conclude regarding the management of sewage farms that "the effectual purification of sewage, even with suitable land, can only be accomplished when the farming operations are relegated to the background and the production of a good effluent considered of primary importance. On the other hand, the manager knows that the crops will probably form an important item in his receipts at the end of the year, and he not unnaturally wishes it to appear that the farm is being worked economically under his supervision. Hence there is a temptation to grow remunerative crops, e. g., cereals, that can not be sewaged (at all events for the greater part of the year), or to refrain from the further sewaging of crops which may be damaged thereby; meanwhile the land which is under sewage must needs yield, owing to the lack of rest, increasingly unsatisfactory effluents. There may of course be some farms where the large area at command in proportion to the volume of sewage to be 'treated' renders the growing of grain crops justifiable, but these are exceptions to the general rule. Land is usually too expensive in the immediate vicinity of towns to allow of this, and the tendency is to take too little rather than too much land for a sewage farm. . . .

"We are unable to recommend the abandonment of farming operations even in connection with filtration sewage farms, because if intelligently pursued they make for profit with increased efficiency of the land. The farming operations, however, should always be under the control of the authorities responsible for the proper working of the farm, and the manager should receive written and explicit directions to regard the crops as of secondary importance to the uniform and satisfactory purification of the sewage."

From a large number of analyses of the sewages used on the different farms and of the effluents obtained, the following averages are calculated:

Average composition of sewages and effluents.

[Parts per 100,000 by weight.]

	Total nitrogen.	Ammoniacal nitrogen.	Albuminoid nitrogen.	Oxygen absorbed.[a]	Chlorin.	Nitric + nitrous nitrogen.
Sewages	5.20–13.3	3.54–8.12	0.67–1.73	7.71–23.12	7.45–14.98	....
Effluents	2.09– 6.0	.13–1.85	.03– .26	.19– 2.72	....	0.37–3.21

[a] From permanganate at 26.7° C. (80° F.) in four hours.

The results show a percentage of chemical purification varying from 84 to 98 per cent calculated on albuminoid nitrogen, and from 81 to 99 per cent based on oxygen absorbed.

From the mechanical analyses of the soils and subsoils and a study of their specific gravity, porosity, and water-holding capacity, the conclusion is drawn "that it is possible to say from the mechanical analysis of a soil whether or not it would be suitable for sewage purification by filtration, and the same thing holds in a lesser degree as regards suitability for surface irrigation. Further, they tend to indicate that the maximum number of particles per gram of soil, which is allowable if the

filtration is to be efficient (a suitable subsoil being assumed), is somewhere about 1,000 millions. . . . If a sufficient number of such mechanical analyses were available for reference, they would afford excellent data as to the volume of sewage of given nature and strength which any particular soil might reasonably be expected to purify."

The results of a study of the different soils with reference to the amount of lime dissolved in 48 hours by water saturated with carbon dioxid and in 24 hours by water alone "indicate that a soil does not require to be rich in lime for nitrification to go on actively in the treatment of an ordinary sewage."

The bacteriological examinations lead to the conclusion that land treatment of sewage does not so modify the biological qualities of sewage as to make it safe to discharge the effluents into drinking-water streams, although sufficiently purified to be discharged into nondrinking-water streams. The intrinsic biological qualities of sewage are not materially modified by land processes of sewage disposal. The bacterial flora of the soil on sewage farms is apt to resemble that of sewage associated to a greater or less degree with characteristic soil organisms. The bacterial flora of the effluents is characteristic of that of the sewage, not of that of the soil.

MISCELLANEOUS.

Fifteenth Annual Report of Arizona Station, 1904 (*Arizona Sta. Rpt. 1904, pp. 465-498*).—This includes the organization list of the station; a report of the director; a financial statement for the fiscal year ended June 30, 1904; and departmental reports, parts of which are abstracted elsewhere.

Twenty-second Report of California Station, 1904 (*California Sta. Rpt. 1904, pp. 228*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1904; a general report on the work of the station by the director; a report on farmers' institutes by E. J. Wickson; lists of exchanges and station publications; and reports of the different divisions of the station and of the substations, parts of which are abstracted elsewhere.

Sixteenth Annual Report of Connecticut Storrs Station, 1904 (*Connecticut Storrs Sta. Rpt. 1904, pp. 250*).—This contains the organization list of the station; a list of available station publications; a financial statement for the fiscal year ended June 30, 1904; reports of the director and heads of departments; and a number of articles, which are abstracted elsewhere in this issue. The report also contains several articles which have already been abstracted from other sources, as follows: The food value of a pound of milk solids in milk poor and rich in fat content (E. S. R., 16, p. 806); protecting cows from flies (E. S. R., 16, p. 814); discussion of the amount of protein required in the ration for dairy cows (E. S. R., 16, p. 911); and a successful brooder house (E. S. R., 16, p. 908).

Annual report of Nevada Station, 1904 (*Nevada Sta. Rpt. 1904, pp. 42*).—This contains a brief statement by the board of control; a report of the director reviewing in a general way the work of the station during the year; a financial statement for the fiscal year ended June 30, 1904; and departmental reports presenting information on the different lines of station work, including notes on forage plants, orchard fruits, trees, animal diseases, weather conditions, field crops, vegetables, etc. A list is given of the varieties of apples, pears, plum, cherries, quinces, apricots, and mulberries grown at the station, together with a record of the irrigation of the station orchard. The varieties planted in the arboretum in the spring of 1904 are listed and a monthly record is given of 2 grade Holstein cows. The animal diseases studied during the year included the sheep disease known as big head and anthrax, glanders, hog cholera, and swine plague.

Imports of farm and forest products, 1901-1903 (*U. S. Dept. Agr., Bureau of Statistics Bul. 31, pp. 66*).—The total value of the farm products imported in 1903 was $456,199,325 and the forest products $71,478,022. Detailed tables are given which show the kind, quantity, value, and source of the different products.

Exports of farm and forest products, 1901–1903 (*U. S. Dept. Agr., Bureau of Statistics Bul. 32, pp. 100*).—This is a statistical report on the kind, quantity, value, and distribution of farm and forest products. The total value of the farm products exported in 1903 was $878,480,557 and the forest products $58,281,124.

Foreign trade in farm and forest products, 1904 (*U. S. Dept. Agr., Bureau of Statistics Circ. 16, pp. 19*).—This preliminary statement shows that the total value of the agricultural exports for 1904 was $859,160,264 and the total value of the agricultural imports $461,434,851. The exports and imports of forest products during 1904 amounted to $69,500,430 and $79,619,296. Meat and meat products, grain and grain products, and cotton comprised 81 per cent of the value of the exports. The leading articles imported were sugar and molasses, animal fibers, coffee, hides and skins, and vegetable fibers.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 6, Nos. 10, pp. 81–88; 11, pp. 89–96; 12, pp. 97–104*).—These numbers for February, March, and April, 1905, contain the usual statistical reports and special articles on the crops in the United States and foreign countries. Some of the principal articles are as follows: British wheat imports for 20 years; imports and exports of the principal agricultural products for the year ended December 31, 1904; life of the Chilian nitrate production; control of the boll weevil; pork packing in the West, and molasses as a feed for live stock.

Fertilizers, foods, seeds, and antiparasitic substances, I. GIGLIOLI (*Ann. Agr.* [*Rome*], *1905, pp. XVI+759*).—Part I deals with the production and sale in Italy of fertilizers, artificial food products, seeds, insecticides and fungicides, the adulteration of these products and the necessity of protecting Italian agriculture from such frauds, and the work of the principal agricultural experiment stations in Italy along these lines. Part II deals with similar control work in other countries.

Proceedings of the State Board of Agriculture, and Farmers' Normal Institute, A. L. MARTIN (*Pennsylvania Dept. Agr. Bul. 131, pp. 259*).—This includes a large number of miscellaneous papers presented at the meeting held in October, 1904.

Agricultural education in France, VIGER (*Indus. Lait.* [*Paris*], *30* (*1905*), *No. 15, pp. 176, 177*).—This is a brief review of the development of agricultural education in France.

Practical studies in agriculture for public schools, M. L. FISHER (*Purdue Univ.* [*Pamphlet*], *1904, pp. 40*).—This is a school of agriculture pamphlet prepared "to assist teachers in country schools to plan and administer simple exercises in the study of natural objects and materials." The pamphlet is divided into two parts. Part 1 contains 27 practical studies in agriculture for the common schools arranged in logical order, beginning with simple experiments with soils under different conditions and different methods of treatment, and taking up seed germination, planting, and purity; root systems and stooling habits of some farm crops; collections of products of the neighborhood; common weeds; animal life of the neighborhood; migration of birds; budding and grafting; insecticides and fungicides; acidity of milk; the use of the Babcock test; effect of temperature on the creaming of milk, and the use of score cards in judging corn and live stock. The second part is devoted to experiments for home study, prepared by different members of the school and station staff. Some of the subjects treated in these experiments are effects of mulches on evaporation; determination of fertilizer needs of a soil; cultivation of corn; variety tests of wheat; seeding alfalfa with and without inoculation and with and without a nurse crop; experiments with strawberries; prevention of oat smut; remedy for potato scab; feeding experiments with poultry, pigs, and calves; studies of balanced rations, of variations in daily yield of milk, of relative yields of different cows, and of the influence of cleanliness and cold on the keeping quality of milk. A list of books for supplementary reading and study and for libraries is appended.

NOTES.

Arkansas Station.—The State legislature has appropriated $35,000 for the station for the biennial period beginning April 1, 1905. Of this amount $10,000 is for salaries in the agricultural, horticultural, entomological, and veterinary departments; $5,000 for dairy building and equipment; $1,500 for dairy and live-stock husbandry; $12,000 for agricultural and horticultural buildings; $2,500 for maintenance of the agricultural department; $2,500 for maintenance of the horticultural and veterinary departments, and $2,000 for student labor. There is provision for the establishment of at least three branch stations, one in the southern, one in the eastern, and one in the central western parts of the State. The veterinary department is charged with the control of contagious and incurable diseases of animals, the inoculation of cattle, and other State work. It is the evident intention that the funds provided in the act shall also be used for instruction work, for section 1 provides that "the board of trustees of the State University shall establish a course of study in connection with the Arkansas Experiment Station for the students who desire to be instructed in practical agriculture, horticulture, entomology, veterinary and kindred subjects, in order that these branches of education may be developed as rapidly as possible and be diffused among the masses of our agricultural people."

California University and Station.—E. J. Wickson has been appointed dean of agriculture, and during the leave of absence granted to Doctor Hilgard will be acting director of the station. Albert M. West, formerly of the Bureau of Animal Industry, this Department, has been appointed assistant in plant pathology in the station.

Colorado College and Station.—W. L. Carlyle was made dean of agriculture at a recent meeting of the board, and will also have charge of the farmers' institutes provided for in the State appropriation. A large number of institutes have been held the past spring and the work organized on an efficient basis. C. J. Griffith, assistant in animal husbandry, has resigned to assume charge of a large ranch, his resignation to take effect at the convenience of the college and station.

Connecticut College.—A summer school for teachers and others in nature study and country life will be held at the college from July 6 to 28.

Florida University.—The legislature has passed a bill abolishing the university and five other State educational institutions, revoking their charters, abolishing their boards of trustees and officers, declaring their assets and property the property of the State, and investing the title to the same in the State board of education, in trust. The act provides for the establishment of two institutions for higher education, viz, a university and a female college; and creates a board of control composed of 5 members appointed by the governor, to act in conjunction with the State board of education in locating these institutions, one east and the other west of the Suwanee River. In locating the university, the lands, buildings, property, and effects of any of the abolished institutions may be appropriated. The university is to embrace agriculture, mechanical and industrial arts, and the experiment station, as well as a scientific and classical department, and a normal department for whites; and it is provided that no student shall be admitted to the university who has not graduated from a high school or its equivalent.

The management of these two institutions, and of the colored normal school and the institute for the deaf, dumb, and blind, is vested in the single board of control mentioned, which also has control of all expenditures. The act appropriates $150,000 for the establishment and maintenance of the four institutions, which is to be allotted in such proportion as the board of education and board of control deem best. The location of the university has not yet been decided upon.

Illinois University and Station.—The regular biennial appropriation for the college of agriculture and experiment station has passed and been approved by the governor. This appropriation is the same as two years ago, with the exception of two sections: The corn section of $10,000 has been changed to a crop section and the amount increased to $15,000. The orchard section has also been increased from $10,000 to $15,000. John M. Trueman, assistant in animal husbandry and dairying at Cornell University and Station, has resigned to accept a position in the department of dairying at the Illinois University and Station.

Iowa College and Station.—A new farm, containing about 300 acres, has been purchased, and is to be used exclusively for the study of problems relating to dairy production.

Louisiana Stations.—An addition is being built to the station building at Baton Rouge, which will be devoted to chemical laboratories, the plan being to move the fertilizer and other inspection work from New Orleans about July 1. Hereafter the offices and laboratories of the stations will be located at Baton Rouge, except for such work as relates to sugar investigations. The latter will be carried on at Audubon Park, New Orleans, as before, with R. E. Blouin, assistant director in charge.

Maryland Station.—Charles F. Doane has resigned his position as dairyman and dairy bacteriologist to accept a position as dairy expert in the Dairy Division of this Department. He entered upon his duties the latter part of May.

Massachusetts College and Station.—The legislature has made an appropriation of $53,000, approximately $40,000 of which will be used for the erection and equipment of a horticultural building. W. P. Brooks has been appointed acting director of the station.

Mississippi College.—A summer normal school for teachers will be held at the college, beginning soon after the close of the spring term and lasting five weeks. The object of this is to make more effective the State law requiring the teaching of agriculture in the country schools.

Missouri University and Station.—The legislature has made an appropriation of $55,000 for the college of agriculture and experiment station for the biennial period. Of this amount $15,000 is for the experiment station, $3,000 for inaugurating a soil survey, $5,000 for a cattle barn, $2,000 for a swine barn, and $5,000 for a laboratory building for farm machinery.

Montana Station.—J. S. Baker, for the past year irrigation engineer of the station, has resigned to become assistant State engineer, with headquarters at Helena. The change took place May 1.

Nebraska University and Station.—The board of regents has decided to erect a woman's building at the school of agriculture, to cost $32,000. The last legislature appropriated $20,000 for 2 years for further equipment and maintenance of the dry-land substation at North Platte. It also gave $12,000 for farmers' institutes. Dr. F. D. Heald, of the department of botany of the university, has been promoted to the position of botanist to the experiment station and associate professor of botany in the school of agriculture.

New Mexico College and Station.—A tract of land containing 23 acres has recently been purchased for the horticultural department. The soil is light and well adapted to truck growing. It is hoped that the air drainage will prove better than that of the old orchard and the injury to fruit from late frosts be lessened. A farm of about

250 acres, adjoining the present farm on the south, has been purchased recently for the agricultural department. One hundred acres of this is already in cultivation and is under irrigation from the main canal. This will be carefully leveled and used mainly for experiments on the duty of water. The other 150 acres lie on a bench several feet higher and can not be irrigated at present. A 1,700-lb. Percheron stallion and a 1,400-lb. French Coach stallion have been added to the college live stock, and are expected to prove the basis of a marked improvement in the horses raised in the vicinity.

New York State Station.—Charles W. Mudge, assistant chemist, has been transferred from this station to the department of agriculture at Albany, at the request of Commissioner Wieting. Alfred W. Bosworth, of Storrs, Conn., and Ernest L. Baker, of Columbia University, have been appointed assistant chemists to succeed F. D. Fuller and F. A. Urner, resigned. By the operation of the law enacted in 1904, which reduces the appointive membership of the board to 7 members, F. C. Schraub, of Lowville, and Jens Jensen, of Binghamton, ceased to be members of the board at the expiration of their terms.

North Dakota College and Station.—A chemical building to cost $45,000 is in process of construction. This building will contain offices and laboratories for station work as well as for college purposes. A library building is being constructed with $15,000 donated by Mr. Andrew Carnegie. This is one of the few land-grant institutions to which gifts for this purpose have been made by Mr. Carnegie, the others being the University of Maine and State College of Pennsylvania. The food-inspection work of the chemist has been so favorably received that additional laws providing for inspection of formaldehyde, Paris green, and paints, and for tests of the milling qualities of different grades of wheat have been enacted, and the food-inspection law has been amended. The appropriation for this work is $9,000 for the biennial period. The last legislature also provided $10,000 for the establishment of a second substation at Dickinson, in the western and drier portion of the State, and L. R. Waldron, formerly assistant botanist of the central station, has been appointed superintendent. W. B. Bell, of the University of Iowa, has been elected to fill the vacancy. The appropriation of $5,000 per annum for the substation at Edgeley was continued.

Oklahoma Station.—The Territorial legislature at its last session passed laws for the control of fertilizers and feeding stuffs and for nursery inspection. These laws are in charge of the board of agriculture, but the chemical work and nursery inspection will be done by the station at stated charges per sample or per diem.

Rhode Island Station.—J. W. Kellogg and Matthew Steel, assistant chemists, have been appointed experts in the Bureau of Soils in connection with the cooperative work which is being carried on between that Bureau and the station. J. P. Gray, a graduate of the Maryland Agricultural College, and P. H. Wessels, of the Michigan Agricultural College, have been appointed assistant chemists in the places vacated by them. The station is making special plans for further study of the conditions affecting the development of infectious entero-hepatitis in turkeys, and will conduct breeding experiments with the idea of securing, if possible, turkeys which will be more resistant to the disease than those which have been bred in the State heretofore.

South Dakota College and Station.—E. C. Chilcott, agronomist, has been appointed expert in connection with the cereal work of this Department, and will enter upon his new duties July 1.

Tennessee Station.—J. E. Converse has been appointed assistant for plat work in the station.

Texas Station.—A feeding-stuff law has been passed by the legislature, which went into effect May 5. The administration of the law is placed in the hands of the director of the station, and a tag tax of 20 cents per ton is provided, which is to be paid into the State treasury, the station being reimbursed for the actual expense of

the inspection. The law requires a guaranty of the percentages of protein and fat, and forbids the addition of any mineral substance, sawdust, dirt, or other foreign substance injurious to the health of animals.

Washington College and Station.—W. S. Thornber, formerly of South Dakota, has been appointed professor of horticulture in the college and horticulturist to the station.

National Farm School.—The State legislature of Pennsylvania has appropriated $12,000 for the school, to be used for agricultural instruction. An offer has been received of a new dormitory, which, with gymnasium arrangements and electrical appliances, will cost about $57,000; and an endowment fund is now being raised to maintain the building. The school receives more applicants for instruction than it can accommodate under present conditions, and there are now about 70 prospective pupils on its waiting list.

School Legislation in Minnesota.—The Minnesota legislature at its recent session passed two laws of considerable importance to the agriculture of the State. One of these provides for the establishment of a branch school of agriculture at Crookston, to be a department of the University of Minnesota under the direction of the board of regents of the university. The other provides for local option in the establishment and maintenance of county schools of agriculture and domestic economy, limiting to $20,000 the amount that any county may appropriate for this purpose in one year. The initiative in the matter of establishing such schools may be taken by the people or by the county commissioners, but the county commissioners can not finally establish a school until the question has been submitted to the electors in the county. Two or more counties may unite to establish a school of agriculture and domestic economy.

The schools are to be under the control of a county school board of 3 members, the secretary of which shall be the county superintendent of schools, and the other 2 members are to be elected by the county commissioners. Each school must have connected with it a tract of land, suitable for purposes of experiment and demonstration, of not less than 10 acres. Tuition is to be free to residents of the county or counties contributing to its support. The State superintendent of public instruction is to have general supervision over the schools, and with the advice of the dean of the College of Agriculture is to prescribe the courses of study to be pursued.

Agriculture in the Public Schools.—According to an item in the *Rocky Mountain News* the Colorado State Board of Agriculture is making an experiment in the introduction of agriculture into the high schools of the State. Members of the State Agricultural College faculty have been giving short courses of lectures in the high schools of Montrose and Delta. If the experiment is successful an attempt will be made by the board to introduce agricultural teaching in all of the high schools of the State next year.

A circular of the Waterford, Pa., High School has been received, which outlines for 1904–5 an agricultural course. This course corresponds to the scientific course of the school, except that lessons on plant life, field, orchard and garden crops, domestic animals, soil physics, and chemistry of soils and of plant and animal life are substituted for parts of English history, physical geography, bookkeeping, social law, commercial geography, and other similar subjects. The course covers 4 years, and the students taking it are required, in addition to their regular laboratory and recitation work, to prepare special papers on agricultural topics, such as soil exhaustion, plant diseases, soil fertility, feeding farm animals, fruit culture, and the beef type. Farmers' meetings, open to all interested in farming, are also held frequently under the auspices of the agricultural department.

The board of supervisors of Coles County, Ill., has voted $100 to assist in introducing the study of agriculture and domestic arts in the public schools of the county,

and the Coles County Agricultural Association has offered premiums aggregating $100 for exhibits of kitchen, dairy, and farm products, flowers and domestic needlework made or grown by the exhibitors and shown at the county fair next fall.

International Congress of Agricultural Education.—In connection with the International Exposition to be held this year at Liege, Belgium, under the patronage of the Belgian Government, there will be a second session of the International Congress of Agricultural Education, July 28 and 29, which the officers of the agricultural colleges and experiment stations in this country are especially invited to attend.

Association of American Agricultural Colleges and Experiment Stations.—The nineteenth annual convention of the Association of American Agricultural Colleges and Experiment Stations will be held at Washington, D. C., in the early part of November next.

National Association for the Study and Prevention of Tuberculosis.—The first annual meeting of this association was held in Washington, D. C., May 18 and 19, 1905. While the greater number of the papers and addresses presented related exclusively to human medicine and sanitation, such as the opening addresses of President Dr. E. L. Trudeau and Vice-President Dr. William Osler, on the importance of education in combating tuberculosis, several papers were of particular interest in connection with the study of tuberculosis in animals.

In the pathological and bacteriological section Dr. W. H. Welch discussed the Channels of Infection in Tuberculosis. The speaker believed that a sufficient number of cases are now on record to demonstrate that tuberculosis may be transmitted from man to animals. As regards the determination of the transmissibility of tuberculosis from animals to man the decisive point was believed to be the recognition of the nature of the bacillus. The speaker referred to the limited number of cases of human tuberculosis which have been accepted as of bovine origin on account of the characteristics of the bacillus, and stated that sufficient evidence has now been obtained to show that the majority of cases of human tuberculosis are of human origin.

Dr. A. J. Richer reported favorable results with the use of Marmorek's antitubercular serum, stating that no effects were observed when this serum was injected into healthy subjects.

Experimental work on Serum Diagnosis of Tuberculosis was reported by Dr. H. M. Kinghorn. A reaction was obtained more frequently in the incipient or favorable cases than in advanced cases of tuberculosis. The speaker did not believe that the serum agglutination test can be relied upon to determine the presence or absence of this disease. While obtaining slightly different results, Dr. H. R. M. Landis agreed that the agglutination test is not at present available for diagnostic purposes.

Particular interest was centered in the studies in immunity in tuberculosis by Drs. Trudeau, E. R. Baldwin, J. L. Nichols, H. M. Kinghorn, and A. H. Allen at Saranac Lake. A detailed report of the properties of the serum of immunized rabbits was read by Dr. Baldwin, and a histological study of the lesions in immunized rabbits was reported in a paper by Dr. Nichols. The authors studied the immunity reaction described in 1893 and 1903 by Dr. Trudeau which results in rabbits first receiving a weak intravenous inoculation of human tubercle bacilli, followed later by a virulent one. Forty-three rabbits were inoculated in this manner and 35 controls received the virulent inoculation only. The animals were killed in pairs of one or more of each set or series in succession from the first to the sixty-first day. Observations of the temperature indicated a higher average for the immunized animals during the first 10 days as compared with the controls, but this was reversed during the next 10 days. The symptoms of illness corresponded with the emperatures. The serum showed earlier and higher agglutination for the immunized animals, and it developed from the fifth to the twelfth day after the virulent

infection. Very few control serums reacted, and none before infection. Koch's emulsion gave more constant results. Arloing's homogeneous culture was irregular and did not react in correspondence with it. Precipitation tests with filtrates of tubercle bacilli extracts were negative. The opsonins of Wright and Douglas were weaker in the immunized rabbits; possibly because the phagocytosis was so much greater, this substance was being exhausted.

The histological study, especially of the lungs, indicated an intense infiltration and congestion in the immunized animals following the virulent inoculation. This increased in degree until the tenth or twentieth day, and then gradually subsided, leaving in many animals practically no trace of tubercles or bacilli. Meanwhile the controls began slowly to form isolated tubercles with caseation leading to a chronic tuberculosis. The prominent characteristics noted were the following: The large collection of epithelioid cells actively engaged in phagocytosis, extravasated blood from the dilated capillaries and a pneumonic appearance of the exudate, absence of caseation, rapid disappearance and degeneration of the bacilli (indicated by their poor staining), and finally, the absorption of all signs of disease. The conclusion is that the specific, acquired immunity rests on enhanced phagocytosis and bactericidal power of the serum due to opsonins or stimulins.

In the experimental work with rabbits, as summarized by Dr. Trudeau, no lasting immunity was secured. Vaccinated animals resisted the disease for a longer period after the inoculation with virulent cultures than the control animals. It would therefore appear that some degree of immunity was conferred by vaccination, though in no instance was complete immunity secured. Better results were obtained in vaccination with the living attenuated cultures than with dead tubercle bacilli. Dr. Trudeau referred to experiments in vaccinating rabbits with tubercle bacilli from cold-blooded animals and with attenuated cultures of human origin. No degree of immunity was apparently conferred by the vaccination with the cultures of the bacilli from cold-blooded animals. The cultures of human origin attenuated by growth for 20 years were apparently ineffective in securing immunity as compared with unvaccinated animals. Slightly better results were obtained by vaccination with cultures attenuated by growth for 14 years. Dr. Trudeau considered it pretty well settled that a living bacillus must be used in securing immunity by vaccination, and that for this purpose the virulence of the organism is a matter of much importance.

In discussing the above papers Dr. Welch called especial attention to the increased tubercle formation in vaccinated rabbits coincident with a certain degree of immunity.

Dr. L. Pearson reported that in experiments with monkeys no immunity had been secured by vaccination with avian tubercle bacilli.

A study of the blood in tuberculosis was the subject of a paper by Dr. J. Ullom and Dr. F. A. Craig.

Dr. D. C. Twichell reported a study of the Viability of the Tubercle Bacillus in Sputum, kept under a variety of conditions. The maximum period during which the bacillus retained its vitality was about 6 months. Darkness and moisture were conditions most favorable to prolonging the duration of the life of the bacillus.

Several papers were read by title, among which was one on the Stability of Cultural Characteristics among Races of Tubercle Bacilli, by Dr. Theobald Smith.

Control of Gypsy and Brown-tail Moths in Massachusetts.—An act recently passed by the State legislature of Massachusetts makes provision for the appointment of a superintendent for suppressing the gypsy and brown-tail moths, and outlines the duties of cities and towns in that connection and the conditions under which they may be reimbursed in part for the expense of suppression. The bill appropriates $300,000, of which $75,000 may be expended during the calendar year 1905, $150,000 during 1906, and the remaining $75,000, with any unexpended balances, up to May 1, 1907. An additional sum of $10,000 in each of the 3 years may be expended for experi-

ments with parasites or natural enemies for destroying these moths. A. H. Kirkland, a graduate of the Massachusetts Agricultural College, and formerly connected with the gypsy-moth work of the State, has been appointed superintendent, at a salary of $5,000 a year.

Personal Mention.—Director E. B. Voorhees, of the New Jersey stations, has been appointed on the New Jersey State forestry commission.

Dr. A. C. True, of this Office, has accepted the chairmanship of the section on production by irrigation of the National Irrigation Congress, which meets this year at Portland, Oreg., August 21–24.

Dr. A. Kraemer, professor of agricultural chemistry in the Polytechnicum at Zurich, will retire October 1.

It is noted from *Science* that Dr. J. Aderhold has been appointed director of the newly established Imperial Biological Institute for Agriculture and Forestry at Berlin.

Prof. F. Wohltmann, for ten years director of the agricultural experiment station at Bonn-Poppelsdorf, and professor of agriculture in the academy, has accepted a call to Halle. In his lectures at Halle Professor Wohltmann will include a course in tropical agriculture with special reference to the German colonies.

It is proposed to erect a memorial to the late Prof. Emerich Meissl in the agricultural experiment station at Vienna, with which he was connected for more than twenty years. The call for subscriptions for that purpose is signed by the minister of agriculture, the present director of the station, Dr. F. W. Dafert, the presidents of the Royal Agricultural Society of Vienna, of the Austrian Chemical Society, and other agricultural organizations.

Miscellaneous.—A pamphlet recently issued by the Vermont State Board of Health, entitled Laws Relative to Pure Food, contains the text of the State pure-food law which was passed at the close of last year, together with rules and regulations prescribed by the board of health to facilitate the enforcement of the law. The latter define a long list of food substances, giving standards in a number of instances. The execution of the law is in the hands of the State board of health.

The *Albany Journal* states that the theme of the Forty-third Convocation of the University of New York, which will be held in Albany June 28, 29, and 30, will be Education as Applied to the Industrial and Commercial Development of the Country. The principal topics to be considered are education for commerce, education for industry, and education for agriculture. The latter subject will be presented by Dean W. A. Henry, of the College of Agriculture of the University of Wisconsin.

The president of the board of agriculture and fisheries of Great Britain has, according to a note in *Nature*, appointed a departmental committee to investigate the pathology and etiology of epizootic abortion, and to determine what preventive and remedial measures, if any, may with advantage be adopted with respect to that disease. The chairman of the committee is Prof. J. MacFadyean, principal of the Royal Veterinary College.

Lord Curzon has laid the foundation stone of the Agricultural College at Pusa, India. This college and experiment station were made possible by a gift of $150,000 by Mr. Henry Phipps, of Pittsburg, to which reference has previously been made (E. S. R., 15, p. 941).

The Belgian Royal Academy has announced the following prize subjects, among others: The Function of Albuminoids in Nutrition, and the Soluble Ferments of Milk. The prizes range from $120 to $200 in value.

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EXPERIMENT STATION RECORD.

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An important conference between representatives of this Department and the experiment stations in the cotton-growing States was held at Washington June 27. The object of the conference was to discuss informally matters relating to the cotton-boll weevil work, and the means and methods of cooperation between the Department and the stations in the conduct of this work. The meeting was attended by the directors of the stations in North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Arkansas, and Oklahoma, and quite generally by the men in charge of special lines of work in the Department.

The aims and objects of the meeting were explained by Secretary Wilson and Dr. B. T. Galloway, following which the Department's work on the various problems presented by the ravages of the cotton-boll weevil and its probable spread were briefly outlined by representatives of the various branches of the work—the cooperative work with farmers by Dr. S. A. Knapp, the entomological and quarantine work by Mr. W. D. Hunter, and the diversification farms by Mr. W. J. Spillman. In addition, the work of the Bureau of Soils in the South was described by Mr. J. A. Bonsteel, and the feeding and breeding work with live stock in its relation to the Southern experiment stations by Mr. G. M. Rommel, of the Bureau of Animal Industry. These talks were quite informal, and served to show the basis upon which the work of the Department is conducted in the Southern States, its relation to other agencies, methods of organization and management, etc.

The director of each station represented was then called upon for suggestions as to what the Department might do to strengthen the work of the stations in the cotton States, and for a statement of views regarding cooperation. This brought out a very frank and free discussion, which developed into a consideration of the whole question as to the relations of the Department and the stations, and the means of adjustment so as to serve the best interests of all concerned.

The station men were a unit in expressing their desire for cooperation, and their appreciation of the advantage which the Department

could be to them in their work. They pointed out the mutual relations of the Department and the stations, as agencies for the advancement of agriculture and the improvement of agricultural practice, and urged that the highest efficiency is secured by these two agencies working in close cooperation where practicable, and in the remaining cases with a full knowledge on the part of station officers as to the work which the Department is doing in their midst. Examples of successful and helpful cooperation in the cotton States were cited, and numerous specific lines of work were suggested upon which the stations desired the Department's aid. Note was taken of these suggestions with a view to compliance at the earliest opportunity, and in several instances definite arrangements for new cooperation were made before the directors left town the following day.

The emergency caused by the ravages and progress of the cotton-boll weevil has induced the Department to undertake an unusually large amount of work on a number of lines in the Southern States. This, in connection with the pressure of circumstances, has led to greater liability of undertaking work independently of the station, or without due consideration of the existing institution. The possible danger of such a course in leading the people to look directly to the General Government for assistance, rather than to their State stations, was illustrated by several speakers.

Thus, while primarily a conference on the cotton-boll weevil work, the whole matter of the relation of the Department and the experiment stations was gone over as it has never been before, and with the utmost frankness and good feeling. Nothing could have been more helpful in clearing the atmosphere and paving the way for cordial relations of cooperation and assistance. This is an important result, both for the future of the boll weevil work and for other lines of work in the Southern States in which the Department and the stations are mutually interested.

The progress which is making among leading educators in this country in the conviction that agriculture should be given a place in courses of study for rural communities, was evidenced at the forty-fourth annual convention of the National Educational Association, held at Asbury Park, N. J., early in July. Elementary agricultural instruction was one of the prominent subjects of discussion at the convention, and it enjoyed the distinction of special mention in the annual address of the president of the association, delivered to thousands of teachers at the opening session. This was perhaps all the more significant as coming from the superintendent of schools of New York City, Dr. William H. Maxwell.

Doctor Maxwell commended the teaching of agriculture in public schools in strong terms, pointing out its advantages to the people in rural communities, and to the nation as well, in the greater efficiency

of its agricultural population. He declared the teaching of agriculture in a practical manner to be just as necessary for the rural school as manual training is for the city school.

The subject was also referred to in a report upon the educational progress of the year by Howard J. Rogers, first assistant commissioner of education of the State of New York, who had charge of the educational exhibits at the Louisiana Purchase Exposition. Miss Susan B. Sipe, of the normal school of Washington, D. C., gave an illustrated talk on the work of the Bureau of Plant Industry of this Department, in relation to agricultural instruction in Indian schools; and Prof. J. B. Smith, of the New Jersey Experiment Stations, presented a paper on "Some of the commoner insect pests and how the children can study them."

Most important of all, however, was the report of the committee on industrial education in schools for rural communities. The report of such a committee was in itself a significant fact, and this was further emphasized by the prominent place given it in the programme and discussions of the association. The committee, which was appointed at the meeting in Boston in 1903, consisted of L. D. Harvey, chairman, superintendent of schools of Menomonie, Wis.; L. H. Bailey, of Cornell University; Alfred Bayliss, State superintendent of public instruction in Illinois; W. T. Carrington, State superintendent of public instruction in Missouri, and W. M. Hays, Assistant Secretary of Agriculture. The report was an elaborate one, comprising nearly a hundred pages; and in addition to giving the arguments for industrial education in rural schools, discussing the form which this should take in different grades of schools, the advantages of consolidated schools, and the preparation of teachers of industrial subjects, it outlined syllabi for courses in nature study, agriculture, and domestic economy for various conditions.

In general the committee maintained that the rural schools, which train nearly one-half of the school population of this country, should recognize the fact that the major portion of their pupils will continue to live upon the farm, and should provide specific, definite, technical training fitting them for the activities of farm life. It adduced strong arguments in support of this position, and emphasized the educational value as well as the practical utility of courses of study framed with this end in view.

But the committee called attention to the difficulties of securing the efficient teaching of agriculture with the present organization of our public school system. It discouraged the wholesale introduction of agriculture in country schools having only a single teacher. "To require by law that every country school-teacher shall give instruction in the elements of agriculture is, in the judgment of the committee, a serious mistake. It will simply result in another failure to be

added to the failures recorded in France, Ireland, and Canada. Such failures are likely to discourage further immediate efforts and prevent the present undertaking of what might otherwise be done."

The committee favored the consolidation of rural schools in order that teachers specially fitted to this work might be secured and the instruction made more efficient. It also advocated the establishment of high schools, to meet the special needs of the rural population for secondary education directly related to agricultural practice.

In the discussion following this report Prof. W. M. Hays made a strong plea in favor of schools specially adapted to the needs of country life. He called attention to the fact that thus far the public high schools have almost exclusively shaped their curricula with reference to the needs of the people living in cities, with the result that the country children attending such schools are drawn away from the farm. While recognizing that under present economic conditions a considerable portion of the country youth would naturally be drawn to the city, he urged that education for the country people should be of such a character as to maintain farm life at a high level and make farmers more efficient and progressive.

Dr. A. C. True, of this Office, pointed out that leaders of agricultural progress are now thoroughly in earnast in demanding that instruction in agriculture shall be made a regular part of our public school system, and that this demand shall be met by teachers and school officers. He stated that enough had been done to show that such instruction could be made successful in elementary and secondary schools, and that it only remained to work out a feasible plan for the general introduction of agriculture into the rural schools. The wide interest which has been aroused, the experiments which are making with different methods, and the intelligent study which is now being given to the subject by educators, make the probable realization of this end not far distant.

Pennsylvania State College celebrated the semicentennial of the granting of its charter in connection with the annual commencement June 11–14. The charter was granted by the State legislature in 1855, largely through the efforts of the Pennsylvania Agricultural Society, but the institution, then designated "The Farmers' High School of Pennsylvania," was not opened for students until 1859.

The special feature of the semicentennial exercises was a series of addresses by graduates and officers of the college, reviewing the history of the institution in different lines. These addresses will be published, and thus form a permanent record of the progress of the college during the first half century of its career. An unusually large number of alumni and former students of the college were in attendance, almost every class since 1861 being represented in the parade on alumni day.

The commencement address was delivered by Dr. W. T. Harris, United States Commissioner of Education.

The college is now in a flourishing condition, having a faculty numbering 59 persons and about 750 students. The equipment has been materially increased within the past two years by the erection of an auditorium seating 1,500, the gift of Mr. and Mrs. Chas. M. Schwab; a spacious library, the gift of Mr. Andrew Carnegie, to which it is expected that later a museum building will be added; a large dining hall and dormitory, known as McAllister Hall; a splendidly appointed dairy building, which is to constitute a portion of the large agricultural building for which the legislature is making provision. All these buildings are of the most substantial character and worthy representatives of the best types of modern college architecture.

The college will receive from the State during the next two fiscal years $75,000 toward the new agricultural building, $30,000 for the maintenance of agricultural courses, $10,000 for the current expenses of the experiment station, $2,500 for tool and poultry houses, and $132,456.33 for general maintenance of the college. Plans are already being made for the appointment of a dean of the agricultural faculty as an officer separate from the director of the station, and the enlargement of the corps of agricultural instructors and investigators is contemplated.

Three students received the degree of bachelor of science this year on completion of the four years' course in agriculture, one of whom graduated with the highest honors and was one of the speakers at commencement; the degree of master of science was given to two others for advanced work in agricultural lines.

No State presents a field of greater promise for the new agricultural education than Pennsylvania. Widespread interest in it has been aroused by the work of the college, the experiment station, and the farmers' institutes, so that a large and enlightened constituency now awaits developments. Given sufficient funds for manning and equipping it, no one will doubt that the agricultural department will soon reflect the same credit upon the college that other highly developed departments have.

RECENT WORK IN AGRICULTURAL SCIENCE

CHEMISTRY.

Annual report on the progress in agricultural chemistry, 1903, A. Hilger, T. Dietrich, et al. (*Jahresber. Agr. Chem., 3. ser., 6 (1903), pp. XXXVI + 661*).—As in previous years this contains abstracts of the more important articles on agricultural chemistry published during the year, with titles of the articles of less importance.

A report on the progress in analytical chemistry during the year 1904, A. Skrabal (*Oesterr. Chem. Ztg., 8 (1905), No. 7, pp. 148-152*).—This is a brief review of investigations bearing on analytical methods and processes.

Report from committee on uniformity in analysis, I, W. F. Hillebrand et al. (*Jour. Amer. Chem. Soc., 26 (1904), No. 12, pp. 1644-1653; abs. in Jour. Chem. Soc. [London], 88 (1905), No. 509, II, p. 197*).—A statement of the objects of this committee and of the policy adopted for the guidance of its work.

A text-book of physiological chemistry for students of medicine and physicians, C. E. Simon (*London: J. and A. Churchill, 1905, pp. 500; rev. in Lancet [London], 1905, I, No. 14, pp. 934, 935*).—A second edition of this text-book, which the publishers state has been revised and enlarged.

Chemical research in agriculture, F. T. Shutt (*Ottawa: Parliament, 1904, pp. 85-112*).—A summary of the work of the chemical division of the Canada Experimental Farms during the past year. Among other topics data were presented regarding the composition of ground pea chips, pea dust, ground pea bran, and a number of other feeding stuffs.

Annual report for 1904 of the consulting chemist, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 65 (1904), pp. 248-257*).—Data are given regarding the analytical work performed during the year, and analyses are reported of feeding stuffs and fertilizers, including decorticated and undecorticated cotton-seed cake, maize, pig meal (which was found to be an oat offal), basic slag, Peruvian guano, town refuse, and ground lime.

Quantitative determination of the carbon dioxid secreted by roots during growth, P. Kossovich (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 4, pp. 482-493*).—The estimation of the carbon dioxid set free by the roots of plants during the cycle of their development was undertaken by the author as a contribution to the general study of the part played by root secretions of carbon dioxid in rendering plant food of the soil available. In these experiments the plants were grown in nutritive solutions which were made to pass through the pots containing the plants and in contact with the roots, and were then collected and the carbon dioxid determined. About 5 liters of the solution flowed through the pots in 24 hours. The solution contained per liter 0.085 gm. sodium nitrate, 0.02 gm. potassium chlorid, 0.02 gm. calcium chlorid ($CaCl_2+6H_2O$), 0.02 gm. magnesium sulphate, and 0.0383 gm. monopotassium phosphate. The plant experimented with was mustard. Seven plants were raised in one pot. A check pot without plants served to determine the carbon dioxid which was present in the solution itself aside from that secreted by the

roots. It was assumed that the solution constantly bathing the roots in its flow absorbed all the carbon dioxid secreted by them. The carbon dioxid was determined every third day, separately for the day (10 hours) and the night (14 hours). It was determined either by direct weighing after absorption in a potash bulb or by Pettenkofer's method (absorption by standard caustic soda solution, precipitation of the carbon dioxid by barium chlorid, and titrating back). Twenty-six estimations for day and 25 for night periods were made during the 75 days of the growth of the mustard. The plant developed luxuriantly and was in full bloom toward the end of the experiment, when it reached a height of 1 meter.

The data obtained show that the amounts of carbon dioxid set free during the day and the night periods were nearly equal, that they gradually increased, though with considerable fluctuations, to the last days of the experiment, and that the largest amount of carbon dioxid secreted in one day was 0.335 gm. and in one night 0.275 gm. The mean amount of carbon dioxid liberated in a day was 0.145 gm., and in a night 0.152 gm. During the entire period of the experiment the mustard secreted 22.437 gm. of carbon dioxid, the amount in 24 hours during the time of its most luxuriant growth having been more than 0.5 gm.

Having shown that the roots of plants secrete considerable quantities of carbon dioxid in the course of their development, the author concludes that this carbon dioxid may in some cases play an essential part in rendering assimilable the insoluble plant food of the soil. In the experiment here described the amount of carbon dioxid set free by the roots was about twenty times greater than would have been required to render soluble all the phosphoric acid assimilated by the plants if it were supplied in an insoluble form. This amount of carbon dioxid would have been sufficient to render soluble all the elements of the ash of the entire plants if it were necessary to assimilate these elements from insoluble substances.—P. FIREMAN.

Acidity of plant roots, C. MONTANARI (*Staz. Sper. Agr. Ital., 37 (1904), pp. 806–809; abs. in Jour. Chem. Soc. [London], 88 (1905), No. 509, II, p. 191*).—The coloration observed by Kohn[a] is stated to be only apparent since similar results are obtained without roots. The reddening of litmus paper in contact with sugar-beet roots is attributed to the diffusion of the root acid.

The preparation of standard solutions of sulphuric acid, B. NORTH and W. BLAKEY (*Jour. Soc. Chem. Ind., 24 (1905), No. 8, pp. 395–397*).—Directions are given for purifying and using sodium bicarbonate for this purpose.

The determination of alkalis in silicates by Smith's method, B. M. MARGOSCHES (*Chem. Ztg., 29 (1905), No. 29, p. 385*).

A crucible cooler for the determination of alkalis according to L. Smith, R. L. STEINLEN (*Chem. Ztg., 29 (1905), No. 27, pp. 364, 365, fig. 1*).

Methods for the examination of maple products, J. HORTVET (*U. S. Dept. Agr., Bureau of Chemistry Circ. 23, pp. 8, fig. 1*).—This is summarized from an article by the author previously noted (E. S. R., 16, p. 846). In this form these directions were intended primarily for the use of chemists of the Association of Official Agricultural Chemists collaborating in testing methods for maple products.

Potassium oxalate as a lead precipitant in sugar analysis, H. E. SAWYER (*Jour. Amer. Chem. Soc., 26 (1904), No. 12, pp. 1631–1635*).—The author has substituted with satisfactory results neutral potassium oxalate for the sodium carbonate required by the official method of the Association of Official Agricultural Chemists for precipitating the excess of lead subacetate previous to the examination with Fehling's solution.

Cinnamon starch, A. BEYTHIEN, H. HEMPEL, and P. BOHRISCH (*Ber. Untersuch. Dresden, 1903, p. 15; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 4, p. 231*).—Studies of the starch found in cinnamon are reported. Like other investi-

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[a] Landw. Vers. Stat., 52 (1899), pp. 315–326.

gators, the authors report starch grain very similar in form and size to those of wheat starch.

A note on urea, R. GAZE (*Arch. Pharm., 243 (1905), No. 1, pp. 78, 79*).—The author reviews previous work on the occurrence of urea in vegetable products, and reports data on the isolation of this body from both ripe and unripe *Lycoperdon bovista*. He also examined *L. cervinum* and found that it contained much mannit but no urea.

A method for the rapid estimation of chlorin in urine, W. M. DEHN (*Ztschr. Physiol. Chem., 44 (1905), No. 1-2, pp. 11-16*).—The author describes a modification of Volhard's method for which he claims accuracy, rapidity, and ease of execution.

The rapid estimation of potassium and sodium in urine and the calculation of results, L. GARNIER (*Compt. Rend. Soc. Biol.* [*Paris*], *58 (1905), No. 12, pp. 549-552*).—The method described is a modification of Autenrieth's method for estimating potassium as perchlorate and Garratt's method for estimating potassium and sodium as sulphates.

The examination of meat, yeasts, and other extracts for xanthin bodies, K. MICKO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 4, pp. 225-237*).—A report and discussion of analytical data (see E. S. R., 15, p. 954).

The hydrolysis of casein, Z. H. SKRAUP (*Ber. Deut. Chem. Gesell., 37 (1904), No. 7, pp. 1596, 1597*).—A number of bodies not previously noted were identified by the author in his studies of the hydrolysis of casein, especially diamino and oxyamino acids.

Hydrolysis of casein by means of hydrochloric acid, Z. H. SKRAUP (*Ztschr. Physiol. Chem., 42 (1904), No. 3, pp. 274-296*).—A fuller report of the author's investigations noted above.

The character of lecithin, R. WILLSTÄTTER and K. LÜDECKE (*Ber. Deut. Chem. Gesell., 37 (1904), pp. 3753-3758; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 4, pp. 218, 219*).—The studies reported have to do with the chemical structure of lecithin.

Carbon tetrachlorid as a solvent in the commercial extraction of fat, L. L. BIANCHINI (*Staz. Sper. Agr. Ital., 37 (1904), No. 2-3, pp. 171-184*).—On the basis of experimental data the value of carbon tetrachlorid for the extraction of fat is pointed out and discussed. The author notes that at present, though a valuable solvent, it is comparatively high in price.

On the determination of solids in milk preserved with formalin, H. HÖFT (*Chem. Ztg., 29 (1905), No. 5, p. 54*).—The percentage of solids in the milk was not appreciably increased by the addition of 4 drops of formalin per 100 cc. of milk. Larger amounts of formalin caused an increase of 0.1 per cent and more. The length of time during which the milk was subjected to the action of formalin was apparently without influence on the content of solids.

Fat analysis, A. OLIG (*Ber. Untersuch. Emmerich, 1903-4, pp. 15-18; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, pp. 431, 432*).—This article has to do with methods of fat analysis with special reference to judging the quality of culinary fats in inspection work.

Improved apparatus for the determination of milk fat by the Gottlieb-Röse method, A. RÖHRIG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 9, pp. 531-538, fig. 1*).

Experiments with the Paasch and Larsen lactoscope, R. EICHLOFF (*Milchw. Zentbl., 1 (1905), No. 3, pp. 123-130*).—The results by this method were slightly higher than by the Babcock and Gerber methods. This was especially true in the case of sour milk.

Determination of butter fat in the presence of cocoanut fat in margarin, A. KIRSCHNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 2, pp. 65-70*).—The author describes a modification of the method of K. Jensen, which is based

upon the fact that the principal volatile fatty acids of butter fat are different from those of cocoanut fat. In this method the caprylic acid, which is present in large quantities in cocoanut fat but in only small quantities in butter fat, is removed by means of silver sulphate, which does not act upon the butyric acid.

Contribution to the knowledge of cotton-seed oil and the Halphen reaction, K. FISCHER and H. PEYAU (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *9* (*1905*), *No. 2, pp. 81–90*).—The results of the investigations indicate that the Halphen reaction can not be depended upon for the detection of cotton-seed oil in other fats, since the cotton-seed oil can be so treated as to render the Halphen reaction negative. The phytosterin test is, therefore, considered essential in determining the presence of cotton-seed oil in lard and other animal fats when the index of refraction, iodin number, saponification number, and color reaction have not clearly shown such an adulteration.

On a color reaction of cotton-seed oil, G. HALPHEN (*Ann. Chim. Anal.*, *10* (*1905*), *No. 4, pp. 140–143*).—This is a brief discussion on the cause of the coloration in Halphen's test for cotton-seed oil.

On the detection of formaldehyde in milk, E. NICOLAS (*Compt. Rend. Soc. Biol.* [*Paris*], *58* (*1905*), *No. 15, pp. 697, 698*).—The greenish fluorescence obtained in milk containing formalin by the addition of amidol or diamido-phenol is believed to permit of the recognition of this preservative when present in quantities of 1:500,000 or even less. In applying this test the casein may be precipitated by acetic or lactic acid and a few crystals of amidol added to the filtrate.

A study of methods for the determination of formaldehyde, R. H. WILLIAMS (*Jour. Amer. Chem. Soc.*, *27* (*1905*), *No. 5, pp. 596–601*).—This is a comparison and criticism of the Legler, hydrogen peroxid, iodometric, and potassium cyanid methods of determining formaldehyde. The author's conclusions are summarized as follows:

"The iodimetric method is rapid and accurate, and preferable for pure dilute solutions.

"The hydrogen peroxid method is the most satisfactory for strong impure solutions. The time necessary for a complete oxidation is widely variable, depending upon concentration and temperature.

"The potassium cyanid method is recommended for dilute impure solutions. The results are lower than those obtained by the oxidation methods.

"The end-point in the Legler method is not satisfactory, which fact, as well as the low results, must be attributed to causes other than the influence of strong acids on hexamethylenetetramin.

"Paraformaldehyde, when present, counts as formaldehyde.

"The discrepancy in the results obtained by the two different types of methods is due to conditions inherent in the methods themselves, not to the presence of impurities or to a polymerized form of formaldehyde. Apparently, either the condensation reactions are not complete, or a small part of the formic acid produced by the oxidation reactions is oxidized further, giving high results."

A colorimetric method for the detection and estimation of formaldehyde, F. BONNET, Jr. (*Jour. Amer. Chem. Soc.*, *27* (*1905*), *No. 5, pp. 601–605*).—The method proposed depends upon the color reaction of morphine with formaldehyde by which it is stated that quantities of formaldehyde as small as 4 parts in 1,000,000 can be detected.

The test solution used is made by dissolving 0.35 gm. of white crystalline morphine sulphate in 100 cc. of cold strong chemically pure sulphuric acid. In applying this test to milk about 60 cc. of the sample is placed in an evaporating dish and 1 cc. of the morphine solution in a watch glass is floated upon the surface. The color produced in this test solution by the vapor of the formaldehyde varies from pink to dark blue, according to the amount of preservative present. When formaldehyde is

present in quantities of 4:100 the coloration appears in a few minutes; when present in amounts of 4:1,000,000 the coloration appears in about 2½ hours. Salicylic acid, benzoic acid, hydrogen peroxid, and other preservatives tested gave no color reaction.

Concerning the estimation of fluorin in wine and beer, F. P. Treadwell and A. A. Koch (*Ztschr. Analyt. Chem., 43 (1904), No. 8, pp. 469–506, figs. 2*).—Different methods of estimating fluorin were critically studied with a view to finding a satisfactory method.

The colorimetric estimation of salicylic acid in foodstuffs, F. T. Harry and W. R. Mummery (*Analyst, 30 (1905), No. 349, pp. 124–127*).—In order to obviate the difficulties experienced in obtaining a good color with ferric chlorid in foodstuffs containing tannin the material is treated with basic lead acetate, when the lead salicylate formed, being readily soluble in caustic alkalis, may be separated from the insoluble lead tannate.

BOTANY.

North American species of Agrostis, A. S. Hitchcock (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 68, pp. 68, pls. 37, figs. 2*).—This bulletin presents the description of 27 species of Agrostis found north of Mexico, together with a list of species excluded and notes on Mexican species. The classification and history of the species, as well as the history of the genus is discussed. The generic description and a key to species are also given.

Notes on plant transpiration, A. Dulov (*Trudui Opuitn. Lysn., 1904, pt. 2; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 5, p. 707*).—The author undertook the study of transpiration in connection with the new growth of pure maple and ash plantings. With this object in view, he examined the humidity of the soil in both plantations and determined the amount of precipitation and the evaporation during the period under investigation.

From the data secured the author endeavored to ascertain the amount of moisture received by the trees from the soil and expended by them for the formation of the organic matter of that year. He found the transpiration coefficient of maple to be 289 and that of ash 399. Notwithstanding the greater evaporation of the ash the latter, according to the author, more successfully resists drought than the maple. This was strikingly demonstrated by the observations in the spring of 1903, when owing to a drought during the preceding fall and a small amount of precipitation during the winter and spring almost all maples died, while the ash trees continued to develop quite normally.—P. FIREMAN.

The transpiration of sun and shade leaves of the olive and other broad-leaved evergreens, J. Y. Bergen (*Bot. Gaz., 38 (1904), No. 4, pp. 285–296, figs. 11*).—The morphological and histological differences of shade and sun-grown leaves of various kinds are shown, and an account is given of the relative amount of transpiration from leaves produced under the different conditions.

The experiments show that under normal conditions for each class of leaves sun leaves transpire from 3 to 10 times as much as shade leaves of the same species. Under abnormal conditions with both classes of leaves the sun leaves of the species studied transpire more than 1½ times as much as the shade leaves. The thinnest and most poorly nourished shade leaves contrast much more sharply with sun leaves in their behavior than do the more normal leaves which are developed in the shade. Shade leaves exposed for some hours to full sunshine may become almost unable to transpire without showing any evidence of wilting.

The relative transpiration of old and new leaves, J. Y. Bergen (*Bot. Gaz., 38 (1904), No. 6, pp. 446–451*).—While making studies on the transpiration of coriaceous evergreen leaves, the author became interested in the subject of the relative activity of old and new leaves. The studies were made on the shores of the Mediterranean, where trees and shrubs are largely evergreen, but the author limits the

use of "evergreen" so as to differentiate between those which are simultaneously deciduous and those which have leaves persisting for more than one year.

A number of species of plants were examined and it was found that the evergreen trees and shrubs in the vicinity of Naples differ greatly in the longevity of their leaves, some of the species having leaves that live only about 15 months, while others live for 2½ years. All of the leaves studied reach their maximum area development considerably before they attain their full thickness. The leaves of 6 out of the 8 species studied transpire more for equal areas when 15 to 18 months old than they do when they have just reached their maximum area, which takes place when they are about 3 or 4 months old. Transpiration for equal weights of leaves is generally more active for leaves of 15 or more months than for those 3 months old or a little older. Epidermal transpiration bears a much smaller ratio to total transpiration in leaves of 3 months than those of 15 months.

Artificial parasitism, G. J. Peirce (*Bot. Gaz., 38 (1904), No. 3, pp. 214–217*).—A preliminary account is given of experiments which indicate a sort of artificial parasitism of peas. The author germinated a number of seeds of peas, and when the radicles had attained a length of 1–2 cm. he inserted them in plants of *Vicia faba*. About 15 cm. above the soil holes were cut with a sharp scalpel in the bean stalks and the radicle of the pea inserted, being pushed into the stem as far as the cotyledons. Afterwards a plaster of Paris mold was formed about the peas for their support.

These pea-bean plants were grown in pots in a cold frame, and at the same time from the same lot of seed others were sown in soils under ordinary conditions. The peas flourished, blossomed, and produced seed which were but slightly smaller than those produced by the soil-grown plants. The plants themselves, however, were considerably reduced in size and weight by the semiparasitism.

Later the seeds produced by the bean-peas were germinated and again inserted in bean plants as described above. These grew, making a second generation of artificial parasites the roots of which had never been in contact with the soil. The peas grew into vigorous, well-proportioned, healthy plants, although somewhat smaller than those of the preceding season. There was no tissue union between the host plant and the parasite. The roots grew downward through internodes and nodes, but never reached the level of the soil, much less the soil itself.

The experiment was terminated by an accident, but it seems to throw some light on the question of the beginning of parasitism.

Hyphoids and bacteroids, P. Vuillemin (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 1, pp. 52, 53*).—The author describes a form of hyphal filaments which is found during winter on the roots of various legumes and which has been previously described as belonging to the fungus *Cladochytrium tuberculorum*. A more recent study of the material shows that it belongs to the genus Pythium. The hyphæ become massed together, surrounded with a mucilaginous capsule, and in many respects are analogous to the bacteroids observed in the root tubercles of leguminous plants.

Conditions of accumulation and reduction of nitrates in plants, N. Nedokvochayev (*Izv. Moscov. Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscou], 10 (1904), No. 1, pp. 257–347*).—This elaborate treatise is divided into 8 chapters:

(1) The distribution of nitric acid in the plant kingdom is discussed, and a long list, with authorities, is given of the plants in which nitric acid has been definitely ascertained. (2) The method used by the author for determining the nitric acid was essentially that of Schloesing as modified by Tiemann. The nitric acid was determined in week-old plants raised in water cultures. (3) The origin of the nitrates in the plants is discussed. A critical survey of the literature establishes the fact that nitrates accumulate in plants only when the soil or the medium in which they grow contains nitrates. By accurate experiments with *Helianthus annuus, Zea*

mays, *Cucurbita pepo*, *Phaseolus multiflorus*, and *Lupinus luteus* the author showed that there exists a direct relation (especially marked in dilute solutions) between the amount of potassium nitrate in the nutritive solution and that of nitrate nitrogen in the plant.

(4) The distribution of nitric acid in the different organs of the plant and in the plants at different ages was studied. On the basis of his experiments the author states that in young plants there are more nitrates in the stems and cotyledons than in the roots, and that as the age of the plants increases (plants of Helianthus and Cucurbita were examined when 1, 2, and 4 weeks old) the quantity of nitrates in the roots also increases. Other observers have found that the amount of nitrates in plants steadily increases until the period of flowering is reached, and that during the period of ripening the nitrates disappear from the plants, reappearing afterwards. The distribution of the nitrates even in one and the same organ is not uniform. The lower part of the stem is richest in nitrates, the peripheric parts of the leaves are poorest.

(5) It is shown that nitric acid enters and accumulates in plants for the most part in the form of potassium nitrate, but that it may also enter in the form of other nitrates. The author experimented with nitrates of potassium, sodium, ammonium, magnesium, calcium, strontium, and barium. All the plants experimented with developed normally in a relatively concentrated solution of potassium nitrate, but with other nitrates much more dilute solution had to be used. Barium nitrate proved to be injurious even in very dilute solution. (6) Experiments are described which show that increased evaporation caused an increase in the accumulated nitrates and also that light induced an increased storing up of nitrates as compared with plants growing in the dark.

(7) The causes of the accumulation of the nitrates in the plants are discussed and the author is inclined to share the view first advanced by de Vries that the importance of the nitrates lies in their contributing to the production of the necessary osmotic pressure in the plants. (8) Discussing the conditions of the reduction of the nitrates accumulated in the plants, the author concludes on the basis of his experiments with the leaves of *Sambucus nigra* and with the young plants of Helianthus, *Zea mays*, and Cucurbita that the reduction of the nitrates can take place in the absence of light, although in that case the reduction does not proceed so energetically as in the presence of light.

A bibliography including 127 titles is appended.—P. FIREMAN.

Transformation of substances in the germination of the seeds of Cucurbita maxima, M. EGOROV (*Izv. Moscov. Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *10* (*1904*), *No. 2, pp. 431–449*).—After a survey of the literature on the subject, the author describes his experiments with *Cucurbita maxima*.

The germination took place in the dark, and samples were examined after the expiration of 6, 10, 20, and 28 days. The results of the analyses are tabulated, and summarizing his experiments the author states that the amount of fat increases during the first period, after which it diminishes, amounting at the end of the fourth period to only about two-thirds of the original content. During the progress of germination the free acids increase while the unsaturated invariably decrease. The quantity of undecomposed glycerids is greatly reduced during the processes of germination.

During the first period there was an increase in the dry matter. During the same period the decomposition of albuminoids reached the maximum. The carbohydrates increased throughout the experiments. The limit of the maximum percentage of starch was not ascertained. It is believed that a decrease in starch may have taken place that was masked by the formation of some soluble carbohydrates.—P. FIREMAN.

Regressive metamorphosis of the albuminoid substances in the higher

plants and the participation in it of the proteolytic ferment, W. S. Butkyevich (*Izv. Moscov. Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscou], 10 (1904), No. 1, pp. 1–142*).

A new sheep poison from Mexico, B. L. Robinson (*Bot. Gaz., 38 (1904), No. 5, pp. 376–378*).—The author reports having received specimens of a plant from Zacatecas, Mexico, which is reputed as being poisonous to sheep which eat it. An examination of the specimen showed that it belongs to the solanaceous genus Bouchetia, and the name *B. arniatera*, n. sp., is given it.

On account of the reputed poisonous qualities of this plant, the author raises the question as to the possible poisonous qualities of the nearly related species *B. erecta*, which occurs rather frequently in the grazing regions of some of the Southwestern States.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 2 (1904), pp. VIII + 1114*).—This is the second annual issue of the catalogue of scientific papers that is issued under the auspices of the International Council by the Royal Society of London. The plan previously described (E. S. R., 14, p. 637) has been continued. In the present volume about 7,000 titles of botanical and related works, mostly published in 1901 and 1902, are given. There is a commendable increase in references to American publications, although the list is not by any means complete.

ZOOLOGY.

Coyotes in their economic relations, D. E. Lantz (*U. S. Dept. Agr., Biological Survey Bul. 20, pp. 28*).—Coyotes are said to be increasing in numbers in many parts of the west. The present bulletin is devoted to a consideration of the economic relations of 8 forms or species which have been recognized in the United States. In certain States bounties have been offered and statistics are given regarding the effectiveness of this method.

Coyotes feed largely upon animal material, but occasionally eat cultivated fruits and berries, wild fruits, and other vegetable substances. Coyotes may be considered as beneficial in so far as they destroy rabbits, prairie dogs, woodchucks, gophers, rats, and other injurious animals. They are harmful, however, in so far as they destroy game birds and mammals and farm animals. The usual means of destruction including poisoning, trapping, hunting, etc., are briefly mentioned.

Observations made on fencing against coyotes indicate that this method may prove quite effective in preventing the attacks of coyotes upon farm animals. The meshes should be not larger than 6 in. square and triangular meshes are to be preferred to square ones.

The rabbit pest in Australasia, R. H. Hooper (*Agr. Economist, 38 (1905), No. 421, p. 8*).—Brief notes are given on the various methods which have been adopted by the governments of New South Wales and New Zealand in combating rabbits. The payment of bounties has been found to be a too expensive method. Trapping rabbits is believed to be of but little practical value. The rabbit industry connected with trapping is discouraged on the ground that it is not of great importance and interferes with more legitimate farm industries.

Heredity of coat characters in guinea pigs and rabbits, W. E. Castle (*Carnegie Inst. Washington, Pub. 23, pp. 78, pls. 6, figs. 8*).—In the course of experiments reported in this paper about 3,000 guinea pigs and several hundred rabbits were reared for the purpose of studying the inheritance of color and color patterns.

According to the author 3 pairs of alternative coat characters conforming in their inheritance to the requirements of Mendel's law may be recognized in guinea pigs; these are albinism, smooth coat, and long coat. The 3 pairs of characters appear to be in correlation. In rabbits 2 pairs of alternative coat characters are recognized, viz, albinism and long coat. Distinction is made between recessive and latent char-

acters, the latter being defined as characters normally dominant which have gradually disappeared.

The biology of cestodes, L. JAMMES and H. MANDOUL (*Compt. Rend. Acad. Sci. [Paris], 140 (1905), No. 4, pp. 271-273*).—A brief account is presented of observations regarding the bactericidal power of the serum of cestodes. This group of worms possesses considerable power of this sort and stands in marked contrast with nematodes in which the serum is not bactericidal.

Birds in relation to agriculture, GUNNING (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 222-224, pls. 4*).—Attention is called to the value of birds in the destruction of insect pests especially at times when some pest such as grasshoppers becomes unusually numerous. The thrushes, warblers, and fly catchers are believed to be worthy of protection.

Our native birds, H. A. SURFACE (*Pennsylvania Dept. Agr., Zool. Quart. Bul., 2 (1904), No. 3, pp. 51-64, pls. 2, fig. 1*).—An account is given of the feeding habits and economic relations of the cuckoos, kingfisher, and woodpeckers in Pennsylvania.

The protection of insectivorous birds, F. PÉNEVEYRE (*Chron. Agr. Canton Vaud, 18 (1905), No. 5, pp. 134-137*).—The benefits to be derived from the presence of insectivorous birds are briefly noted, and suggestions are made regarding methods of protecting them.

Insectivorous birds, A. J. NORTH (*Agr. Gaz. New South Wales, 16 (1905), No. 3, pp. 247-250, figs. 3*).—A new genus of the order Passeres is described under the name Oreoscopus. These birds are said to be of considerable value on account of their insectivorous habits.

Injury to trees by the green woodpecker (*Jour. Bd. Agr. [London], 11 (1905), No. 11, pp. 693, 694*).—Oak, pine, and old fruit trees are considerably injured by the green woodpecker. The bird bores large holes into the trunks of these trees and an examination of a number of these holes fails to show that they are in the vicinity of insect borers. Apparently the bird feeds upon the sap, cambium, and young bast layers. In some instances the woodpeckers eat the callus forming along the edge of wounds.

Recommendations of State game commissioners and wardens for 1905, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Circ. 47, pp. 12*).—In this circular the author presents a digest of recommendations of State game commissioners and wardens in different States and Territories in this country. These recommendations concern the subjects of big game, shore birds, waterfowl, bag limits, sale, licenses, commissions, propagation, game preserves, and related subjects.

The monthly bulletin of the division of zoology, H. A. SURFACE (*Pennsylvania Dept. Agr. Mo. Bul. Div. Zool., 2 (1904), No. 8, pp. 227-256; 2 (1905), No. 9, pp. 257-288, figs. 3*).—Brief notes are given on methods of studying zoology, winter protection of quail and other birds, combating injurious insects, methods of collecting insects, nurseries in Pennsylvania, the protection of trees from the attacks of mice, rabbits, etc.

METEOROLOGY—CLIMATOLOGY.

Proceedings of the third convention of Weather Bureau officials held at Peoria, Ill., September 20, 21, 22, 1904 (*Washington: Government Printing Office, 1904, pp. 267, pls. 13, figs. 40*).—An account of the proceedings containing an address by the president, W. L. Moore, and the following papers: Laboratory Work in Meteorology, by A. G. McAdie; The Mount Weather Research Observatory, by F. H. Bigelow; Errors of Meteorological Instruments and the Lines Along Which Improvements Should be Sought, by C. F. Marvin; Long-Range Weather Forecasts, by E. B. Garriott; Seasonal Forecasts, by A. G. McAdie; Amplification of Forecasts for the Benefit of Shippers of Perishable Products, by W. M. Wilson; An Aid in Forecasting, by F. H. Brandenburg; Report of Board Appointed to Consider the

Revision of Meteorological Forms, by H. J. Cox et al.; Forecasting Fogs on the West Gulf Coast, by B. Bunnemeyer; Variations in Insolation and in the Polarization of Blue Sky Light during 1903 and 1904, by H. H. Kimball; A Popular Account of the Countercurrent Theory of Storms, by F. H. Bigelow; A Possible Method for Determining the Direction and Velocity of Storm Movement, by E. H. Bowie; Temperature Forecasts and Their Relation to Iron Ore Shipments during the Late Fall and Early Winter Months, by H. W. Richardson; Distribution of Forecasts by Telephone, by G. M. Chappel; Practical Rules for Forecasting Flood-Crest Stages for Cairo, Ill., by P. H. Smyth; The Columbia River, by E. A. Beals; Some Diurnal Periodicities in the Climate of Baltimore, by O. L. Fassig; Instruction and Research by Weather Bureau Officials, by C. Abbe and F. L. Odenbach; Meteorology in Universities and Other Institutions; Phenological Observations at Wauseon, Ohio, by J. W. Smith; A Study of Rainfall on the West Florida Coast, by B. Bunnemeyer; Climatology of Porto Rico, by W. H. Alexander; Monthly Statement of Averages for Rural Press, by W. S. Belden; Irregularities in Frost and Temperature in Neighboring Localities, by I. M. Cline; and Former Conventions of Weather Bureau Officials, by J. Berry.

Long-range weather forecasts (*U. S. Dept. Agr., Weather Bureau Bul. 35, pp. 68, figs. 2*).—This bulletin includes papers by E. B. Garriott and C. M. Woodward, which present a verification of the work of the most prominent of the so-called long-range weather forecasters in the United States, showing the fallacy of their predictions and pointing out the impossibility of basing weather predictions on planetary influences. The literature of long-range weather forecasts is reviewed and the opinions of leading scientists regarding such forecasts are quoted.

The bulletin "refers to theories regarding weather periodicities depending upon lunar and planetary influences; summarizes results obtained by comparisons of maximum and minimum sun-spot periods with the phenomena of the earth's atmosphere; states that the next advance in meteorological science must result from extensive research in solar physics and terrestrial magnetism and comparison of solar and terrestrial phenomena; assumes that advances in the period and accuracy of the official weather forecasts depend largely upon a study of atmospheric pressure over great areas, and a determination of the influences that occasion normal and abnormal distribution of the greater atmospheric areas."

The Chief of the Weather Bureau in his letter of transmittal states that as a result of "personal verification of the work of long-range weather forecasters, some of whom have so far gained the confidence of the rural press as to receive liberal compensation for their prediction," he is led to the conclusion that these forecasters do positive injury to the public at large.

Annual summary of meteorological observations in the United States, 1904 (*Mo. Weather Rev., 32 (1904), No. 13, pp. XIII+593–620, fig. 1, charts 8*).—This number gives a table of contents, list of corrections, additions, and changes, and an index for volume 32; and a summary of observations on temperature, pressure, precipitation, wind movement, cloudiness, and other meteorological phenomena "based essentially upon data received from about 166 regular Weather Bureau stations, 33 regular Canadian stations, and from such climate and crop sections as have forwarded their annual summaries in time." A report of the Chief of the Weather Bureau for the year ended June 30, 1904, is included.

Meteorological observations, C. D. Woods (*Maine Sta. Bul. 111, pp. 215–217*).—A summary of monthly averages of observations at Orono, Me., during 1904, on atmospheric pressure, precipitation, cloudiness, and wind movement, with means for temperature and precipitation for 36 years, and monthly and annual precipitation for the same year at 20 different places in Maine. The annual summary for Orono is as follows: Pressure 29.86 in., temperature 40.67° F. (mean for 36 years 42.15), precipitation 39.02 in. (mean for 36 years 44.26), snowfall 92.4 in. (average for 36

years 92.2). The year 1904 was exceptionally cold. The total precipitation was a little greater than during 1903, but still 6 in. below the average.

Meteorological observations, J. E. OSTRANDER, C. H. CHADWICK, and G. W. PATCH (*Massachusetts Sta. Met. Buls. 195, 196, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1905. The data are briefly discussed in general notes on the weather of each month.

Meteorological observations, H. L. PRICE (*Virginia Sta. Rpt. 1904, pp. 17–19*).—Tables are given which show monthly averages of observations at Blacksburg, Va., on temperature, precipitation, direction of wind, and cloudiness for the calendar year 1904, and monthly means of temperature and precipitation during 12 years (1893–1904). The mean temperature for the year ended December 31, 1904, was 49.9° F., the precipitation 32.25 in.

Agricultural meteorology, 1904, MARIÉ-DAVY (*Jour. Agr. Prat., n. ser., 9 (1905), No. 9, pp. 276, 277*).—A brief summary of observations at Paris on pressure, temperature, humidity, rainfall, wind, etc.

Meteorology of Tunis, autumn of 1904 (*Bul. Dir. Agr. et Com. [Tunis], 9 (1905), No. 34, pp. 146–157*).—A summary of observations on pressure, temperature, rainfall, evaporation, humidity, etc., at a large number of stations in different parts of Tunis.

Sunshine tables, C. F. MARVIN (*U. S. Dept. Agr., Weather Bureau Doc. 320, pts. 1, 2, 3, pp. 25 each*).—These tables, which are revised to 1905, give "the times of sunrise and sunset in mean solar time and the total duration of sunshine for every day in the year, latitudes 20 to 50° north." They have been computed from Smithsonian Meteorological Tables, 1897, giving the duration of sunshine for each 20 minutes of solar declination.

Report on the climate of Baltimore and vicinity, O. L. FASSIG (*Md. Weather Serv. Spec. Pub., 2 (1904), pt. 1[a]*).—The report is modeled on the lines of Hann's *Handbuch der Climatologie*. A complete summary is given of data regarding pressure and temperature, and each element is considered with reference to (1) diurnal period, (2) annual period, and (3) variable or non-periodic aspect.

Atmosphere and climate in relation to agriculture, A. LINTON (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 5, pp. 159–168*).—A general discussion of this subject with special application to conditions in Egypt.

WATER—SOILS.

Underground waters of Eastern United States, M. L. FULLER (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 114, pp. 285, pls. 18, figs. 40*).—"The aim of the paper is to present a brief summary of the underground water conditions in the States east of the Mississippi and in those States bordering that river on the west. It is prepared to meet the demand of drillers and others for general information relating to the broader features of the occurrence of underground waters in the various States or districts."

Preliminary report on the underground waters of Washington, H. LANDES (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 111, pp. 85, pl. 1*).—"This report contains a brief account of the water resources of Washington as represented by municipal supplies, deep wells, and springs. For each county a general statement is made, giving the location, rainfall, and most striking features of topography and geology. Following this are detailed statements, which give data concerning the municipal systems, deep wells, and springs." A map of the State giving isohyetose lines is included.

Underflow tests in the drainage basin of Los Angeles River, H. HAMLIN (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 112, pp. 55, pls. 7, figs. 30*).—

"The purpose of this report is to assemble in one publication the results of a series of underflow tests made in the drainage basin of Los Angeles River in 1902 and 1903 by the United States Geological Survey.

"The report briefly describes the conditions under which ground water usually occurs, especially in arid regions, and the fluctuations in its water level due to rainfall and to sinking flood waters.

"The method of testing used was invented by Prof. Charles S. Slichter, and is fully described in 'The Motions of Underground Waters' [E. S. R., 14, p. 640].

"An attempt has been made to describe briefly the method of sinking test wells and the machinery designed and used during this investigation. The various devices used in testing and the arrangement of the instruments, the methods of testing found most satisfactory, the results obtained at each of the testing stations, and the amount of underflow supposed to pass the Huron street section, are fully described."

Field operations of the Bureau of Soils, 1903 (fifth report), M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1903, pp. 1310, pls. 3, figs. 61, maps 78*).—This report contains a general review of the work of the Bureau of Soils during 1903 by the Chief of the Bureau, together with the following accounts of surveys:

Soil Survey of the Connecticut Valley, by E. O. Fippin; Soil Survey of the Syracuse Area, New York, by F. E. Bonsteel, W. T. Carter, jr., and O. L. Ayres; Soil Survey of the Long Island Area, New York, by J. A. Bonsteel et al.; Soil Survey of the Lockhaven Area, Pennsylvania, by J. O. Martin; Soil Survey of the Dover Area, Delaware, by F. E. Bonsteel and O. L. Ayres; Soil Survey of Worcester County, Maryland, by F. E. Bonsteel and W. T. Carter, jr.; Soil Survey of the Leesburg Area, Virginia, by W. T. Carter, jr., and W. S. Lyman; Soil Survey of the Norfolk Area, Virginia, by J. E. Lapham; Soil Survey of the Craven Area, North Carolina, by W. G. Smith and G. N. Coffey; Soil Survey of the Asheville Area, North Carolina, by J. E. Lapham and F. N. Meeker; Soil Survey of the Campobello Area, South Carolina, by A. W. Mangum and A. S. Root; Soil Survey of the Fort Valley Area, Georgia, by W. G. Smith and W. T. Carter, jr.; Soil Survey of Gadsden County, Florida, by E. O. Fippin and A. S. Root; Soil Survey of the Fort Payne Area, Alabama, by G. B. Jones and M. E. Carr; Soil Survey of the Huntsville Area, Alabama, by F. Bennett, jr., and A. M. Griffen; Soil Survey of the Mobile Area, Alabama, by R. T. A. Burke et al.; Soil Survey of the McNeill Area, Mississippi, by W. G. Smith and W. T. Carter, jr.; Soil Survey of Ouachita Parish, Louisiana, by T. D. Rice; Soil Survey of the New Orleans Area, Louisiana, by T. D. Rice and L. Griswold; Soil Survey of Acadia Parish, Louisiana, by T. D. Rice and L. Griswold; Soil Survey of the Nacogdoches Area, Texas, by W. E. Hearn and J. L. Burgess; Soil Survey of the Lufkin Area, Texas, by W. E. Hearn et al.; Soil Survey of the Woodville Area, Texas, by J. E. Lapham et al.; Soil Survey of the Jacksonville Area, Texas, by W. E. Hearn and J. L. Burgess; Soil Survey of the Paris Area, Texas, by T. A. Caine and A. E. Kocher; Soil Survey of Miller County, Arkansas, by J. O. Martin and E. P. Carr; Soil Survey of the Pikeville Area, Tennessee, by H. J. Wilder and W. J. Geib; Soil Survey of Davidson County, Tennessee, by W. G. Smith and H. H. Bennett; Soil Survey of Scott County, Kentucky, by R. T. A. Burke; Soil Survey of Mason County, Kentucky, by R. T. A. Burke; Soil Survey of the Ashtabula Area, Ohio, by J. O. Martin and E. P. Carr; Soil Survey of the Pontiac Area, Michigan, by H. J. Wilder and W. J. Geib; Soil Survey of Madison County, Indiana, by R. T. A. Burke and La M. Ruhlen; Soil Survey of Sangamon County, Illinois, by G. N. Coffey et al.; Soil Survey of Johnson County, Illinois, by G. N. Coffey et al.; Soil Survey of Knox County, Illinois, by G. N. Coffey et al.; Soil Survey of Winnebago County, Illinois, by G. N. Coffey et al.; Soil Survey of McLean County, Illinois, by G. N. Coffey et al.; Soil Survey of the Viroqua Area, Wisconsin, by W. G. Smith; Soil Survey of the Marshall Area, Minnesota, by H. J. Wilder; Soil Survey of Story

County, Iowa, by H. W. Marean and G. B. Jones; Soil Survey of Cerro Gordo County, Iowa, by H. W. Marean and G. B. Jones; Soil Survey of Shelby County, Missouri, by R. T. A. Burke and La M. Ruhlen; Soil Survey of the Parsons Area, Kansas, by J. A. Drake; Soil Survey of the Russell Area, Kansas, by A. W. Mangum and J. A. Drake; Soil Survey of the Grand Island Area, Nebraska, by W. E. Hearn and J. L. Burgess; Soil Survey of the Stanton Area, Nebraska, by W. E. Hearn; Soil Survey of the Brookings Area, South Dakota, by F. Bennett, jr.; Soil Survey of the Fargo Area, North Dakota, by T. A. Caine; Soil Survey of the Jamestown Area, North Dakota, by T. A. Caine and A. E. Kocher; Soil Survey of the Blackfoot Area, Idaho, by W. E. McLendon; Soil Survey of the Solomonsville Area, Arizona, by M. H. Lapham and N. P. Neill; Soil Survey of the Laramie Area, Wyoming, by N. P. Neill et al.; Soil Survey of the San Luis Valley, Colorado, by J. G. Holmes; Soil Survey of the Provo Area, Utah, by A. M. Sanchez; Soil Survey of the Baker City Area, Oregon, by C. A. Jensen and W. W. Mackie; Soil Survey of the Salem Area, Oregon, by C. A. Jensen; Soil Survey of the San José Area, California, by M. H. Lapham; Soil Survey of the Imperial Area, California (extending the survey of 1901), by J. G. Holmes et al.; Soil Survey of the Indio Area, California, by J. G. Holmes et al.; Soil Survey of the Los Angeles Area, California, by L. Mesmer.

During the field season of 1903, 26,543 square miles or 16,987,520 acres were surveyed and mapped on a scale of 1 in. to the mile. Prior to that year the total area surveyed and mapped was 33,868 square miles or 21,675,520 acres. The average cost of the work in 1903 was $2.22 per square mile. The accounts of the individual surveys include, as heretofore, data relating to the location, history, topography, physiography, geology, climate, agricultural conditions, type soils, and crop adaptations.

During the year the method of printing and distributing the reports of the soil survey was changed as a result of Congressional action providing for the printing and distribution of advance sheets. This, it is believed, will not only greatly facilitate the publication of the several reports, but will also provide a larger and much more convenient form for local distribution.

Land: How it is used and abused, J. LONG (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 103-120*).—A general discussion of this subject, pointing out how lands may be utilized to better advantage by more judicious selection of methods of culture and cropping. The utilization of small holdings of the run-down lands in Great Britain for homes for the pauper and vagrant classes is suggested.

Methods of tillage, old and new, P. M'CONNEL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 121-144, figs. 17*).—This is a résumé of a previous article by the author[a] on the history and use of tillage implements, including references to the great changes which have occurred during the last 10 or 12 years "in our ideas on plowing and cultivating land, and in our methods of doing the work," more particularly in the British colonies and the United States. The topics discussed are plows and plowing, harrows, cultivators, steam diggers, and motors.

Influence of plowing and mellowing the soil on its temperature, A. TOLSKI (*Trudui. Opuitn. Lyesn., 1904, No. 2; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 5 (1904), No. 5, p. 707*).—Observations were made in 1903 in the Borov experiment forest on the temperature of the soil in two clearings, in one of which the soil was plowed and made mellow, while in the other the soil remained unplowed and unmellowed.

The observations showed that plowing and mellowing promoted a more rapid exchange of heat in the soil. The heating as well as the cooling of the plowed and mellowed soil was considerably greater than that of unplowed soil, the difference between the mean temperatures of the two during the summer reaching 2 degrees and between the extreme maximum temperatures 5 and more degrees. On the

[a] Trans. Highland and Agr. Soc. Scotland, 5. ser., 6 (1894).

other hand, the minimum temperatures were lower on plowed soil than on unplowed by almost 1 degree.—P. FIREMAN.

The maintenance of fertility. Liming the soil, C. E. THORNE (*Ohio Sta. Bul. 159, pp. 165–196, figs. 12*).—The bulletin discusses the functions of lime in the soil, the average amounts of lime, potash, nitrogen, and phosphoric acid found in average crops of corn, oats, wheat, clover, and timothy as grown in Ohio, and describes methods of determining the need of lime in soils, the kinds of lime to use, and the best methods of application. It summarizes results of field experiments recently undertaken on the cold, heavy clay soil of the test farm at Strongsville and the worn clay soil of the test farm at Germantown, as well as results of experiments which have been carried on for a series of years on the light sandy clay soil of the station farm at Wooster with corn, clover, oats, and wheat.

The soil at the main station "has been under exhaustive cropping for many years, and though requiring liberal manuring or fertilizing for the production of profitable crops, it responds promptly to such treatment." It has been increasingly difficult to grow clover on this soil during recent years. The growth of clover has also been poor on the soil of the test farm at Strongsville, but somewhat better on that at Germantown, though not entirely satisfactory.

"On the soil of the main station, naturally somewhat deficient in lime because of its origin, the condition unfavorable to clover is aggravated by the use of fertilizing materials originally compounded with acid, such as acid phosphate, potassium chlorid, and ammonium sulphate, although these materials are by no means the sole cause of this condition. On this soil a luxuriant growth of clover has been secured by the use of lime, in conjunction with materials carrying both phosphorus and potassium. Lime alone, though increasing the growth of clover somewhat, does not produce a full yield nor does such a yield follow the use of lime in association with a carrier of phosphorus only or of potassium only. When the lime has been applied to the corn crop, 2 years before the clover seed was sown, the corn being followed by oats and wheat, the effect on the clover has been much better than when the lime was applied to the wheat crop the fall before sowing the clover seed. . . .

"When lime has been applied directly to the wheat crop it has sometimes reduced the yield of wheat. When an increase of wheat has immediately followed liming the gain seems to have been largely due to the opening up of a refractory clay soil by the lime.

"A ton of lime to the acre has been sufficient to produce a luxuriant growth of clover at the main station, together with a considerable increase in the cereal crops preceding the clover. It is possible that a smaller quantity would have sufficed. On this point investigations are in progress. At the Strongsville test farm, however, the present indications are that a much larger quantity of lime may be required.

"Thus far the effect of lime at the Germantown test farm has been negative, if not actually injurious.

"No superiority has yet been discovered in 'hydrated' lime over ordinary lime."

On the lime requirements of plants, O. LOEW (*Landw. Jahrb., 34 (1905), No. 1, pp. 131–137*).—Replying to criticisms by Meyer, of the author's well-known hypothesis, the latter summarizes the results of various investigations to confirm his conclusion that, other things being equal, plants thrive best when there is a certain definite relation between lime and magnesia in the medium in which they grow.

Factors in crop production with special reference to permanent agriculture in Illinois, C. G. HOPKINS (*Illinois Sta. Circ. 87, pp. 32*).—This is a paper which was read before the Illinois State farmers' institute at Joliet in February, 1905.

It emphasizes the importance of producing and maintaining large crop yields on Illinois lands, and illustrates in some detail the principle of measuring land values by crop yields, on the basis of selling the crops at the local markets. The discussion is confined largely to the subject of plant food, but reference is also made to 5 other

essential factors of crop production, namely, heat, light, moisture, physical condition of the soil, and seed.

The results of studies made by the station of the plant food in typical Illinois soils and the crop yields and fertilizer requirements of these soils are summarized, with suggestions as to the best methods of improving these soils and permanently maintaining their fertility.

The following system of farming to insure high productive capacity of the soil is outlined:

"(1) Thorough underdrainage wherever needed.

"(2) Applications of ground natural limestone whenever necessary to correct and prevent soil acidity.

"(3) Continued use of large quantities of fine ground natural rock phosphate (or some other form of phosphorus) in connection with decaying organic matter by which the phosphorus is made available, and by this means gradually increasing the total phosphorus content of the soil, even though maximum crops are removed.

"(4) Liberal use of clover and other legumes in rotation and as catch crops, by which nitrogen and organic matter will be added to the soil.

"(5) Feeding of all crops excepting some of the most valuable grains or other high-priced products and returning all manure to the land, by which means the supply of potassium, the most abundant plant-food element in our common soils, will be practically maintained. The manure together with the legume crop residues will effect an increase or permanent maintenance of the supply of nitrogen and organic matter in the soil.

"With the use of sufficient limestone to keep the soil sweet and abundant use of legume crops and catch crops, and the addition to the soil of a ton of ground rock phosphate or its equivalent every six or eight years, in connection with all of the farm manure which can be made, the ordinary lands of the Central West can be made to grow large crops indefinitely."

Soil treatment for the lower Illinois glaciation, C. G. Hopkins and J. E. Readhimer (*Illinois Sta. Bul. 99, pp. 561–599, figs. 12*).—The methods of treatment described in this bulletin are based upon the results of chemical soil analysis (E. S. R., 15, p. 23), and of several years' field experiments on four soil-experiment fields located in different parts of southern Illinois, especially on the common prairie soil in the lower Illinois glaciation, the oldest glaciated area in the State.

"This great area of agricultural land of depleted fertility includes the counties of Fayette, Effingham, Jasper, Marion, Clay, Richland, Washington, Jefferson, Wayne, Edwards, Perry, Franklin, and Hamilton, and parts of as many more surrounding counties. The principal type of soil in this area is a gray silt loam. It is not strictly a clay soil, although it is quite commonly spoken of as 'clay,' sometimes as 'white clay.' Silt consists of soil particles smaller than sand, and impalpable, but it is not sticky, plastic clay."

The different fields are described and the results of experiments with various crops and crop rotations and fertilizers are summarized. The principal results and recommendations are in brief as follows:

"(1) It is possible to adopt a profitable system of farming that will make the soils of southern Illinois permanently productive.

"(2) Chemical analyses show these soils to be quite deficient in nitrogen and organic matter, very deficient in phosphorus, only moderately well supplied with potassium, and markedly acid.

"(3) The effects of tile drainage upon these soils under certain conditions of season and treatment are very suggestive.

"(4) Very beneficial results with legumes are obtained from the use of lime.

"(5) The results obtained from experiments strongly confirm the universal experience as to the very great value of farm manure upon this type of soil.

"(6) By the use of liberal applications of lime and thorough inoculation with the proper nitrogen-gathering bacteria, clover can be grown on this type of soil with profit.

"(7) While under certain conditions largely increased yields of oats and of corn have been obtained from the use of potassium, it is still questionable if commercial potassium can be used with profit.

"(8) Phosphorus is the limiting element in these soils and must be used liberally in order to make them permanently productive.

"(9) A liberal use of legumes, to supply organic matter and nitrogen, must be an essential part of any practical and economical system that ever becomes successful in the permanent improvement of southern Illinois soils.

"(10) It is good farm practice to remove large quantities of plant food from the soil provided as large or larger amounts be returned when necessary."

Science and sense in the inoculation of legumes, C. G. HOPKINS (*Illinois Sta. Circ. 86, pp. 7*).—A circular of information regarding this subject.

Experiments on the accumulation and utilization of atmospheric nitrogen in the soil, E. B. VOORHEES and J. G. LIPMAN (*New Jersey Stas. Bul. 180, pp. 37*).—Experiments in boxes containing 160 lbs. of artificial soil which had been used in vegetation experiments during 3 previous seasons are reported, the experiments being so arranged "as to bring out the relation of leguminous crops, such as cowpeas, to the soil nitrogen, and to determine, as far as practicable, the value of this leguminous crop as a source of nitrogen to subsequent non-leguminous crops. . . .

"Nitrogenous manures were added or withheld, according to the following plan of study: (1) The study of the source of nitrogen to cowpeas under the following conditions: (a) Without addition of nitrogen, (b) the addition of different amounts of nitrate nitrogen, (c) the addition of different amounts of dried blood nitrogen, (d) the addition of different amounts of ammonia nitrogen in ammonium sulphate, (e) the addition of different amounts of cow manure nitrogen. (2) The availability of cowpea nitrogen, as compared with nitrate, organic (in dried blood), ammonia, and manure nitrogen for the growth of the non-legumes. (3) The possible accumulation of nitrogen in cultivated but uncropped soils."

Data are given which show the balance of income and outgo of nitrogen with the different systems of fertilizing under cowpeas and a succeeding crop of millet, as well as the availability of the nitrogenous materials applied to the different boxes. The results show that with two exceptions there was a gain of soil nitrogen under all of the conditions of these experiments. The cowpeas converted the soluble soil and fertilizer nitrogen as well as atmospheric nitrogen into insoluble proteid nitrogen which the subsequent crop of millet secured through a complicated series of bacterial changes. There were evidently some losses of nitrogen from the soil, but "by some process or processes in the soil itself, the loss of nitrogen was more than made up by the formation in the soil of nitrogen compounds at the expense of the free nitrogen of the atmosphere." It is estimated that the average gains noted in these experiments approximate an increase of one-third in the nitrogen during two growing seasons.

"Assuming the nitrogen content of a fair arable soil to be 5,000 lbs. per acre to a depth of 1 ft., an increase by one-third of this amount would mean more than 1,600 lbs. of nitrogen per acre, and that in the course of only two short growing seasons. Further comparison reveals the fact that the fixation was greatest in the series where the greatest amount of manure was applied, and that the next greatest amount of nitrogen occurred in the series where the smaller quantity of manure was applied. Furthermore, the final gains thus secured represent an amount less than that actually present, for there probably was a more or less extensive volatilization of nitrogen from these soils in the course of decay."

The bulletin gives definitions of some of the more important bacteriological terms used as well as a brief review of literature relating to the fixation of free nitrogen by soils and leguminous plants, and briefly discusses the practical value of an application of the information on this subject in the inoculation of soils.

Lost fertility: The production and loss of nitrates in the soil, R. WARINGTON (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 148-181*).—"The object of the present paper is to bring together and discuss some of the results of the Rothamsted investigations as to the qualities of nitrates which pass, under various circumstances, into our agricultural subsoils or fail in other ways to contribute to the fertility of the land. The investigations in question have been published at various times during the last 20 years. The most recent publication occurred in the lectures delivered by Dr. Bernard Dyer in America in 1900, under the provisions of the Lawes' Agricultural Trust, and published by the United States Department of Agriculture in 1902 [E. S. R., 13, p. 927]."

FERTILIZERS.

Methods of distributing fertilizers (*Jour. Soc. Agr. Suisse Romande, 45 (1904), Nos. 9, pp. 179-196; 10, pp. 250-254*).—Comparative trials conducted by Berthault and Bretignière in different parts of Switzerland of applying fertilizers in the hill, in rows, or broadcast are summarized. The results favor application in the hill when the land is poor and the amounts of fertilizers used are small.

The quest of nitrogen, L. H. BAILEY (*Country Calendar, 1 (1905), No. 1, pp. 27, 28, 66, 68*).—This article briefly discusses the importance of nitrogen as a plant food, reviews investigations which have been made with reference to its functions and sources of supply, and describes methods and possible benefits of soil inoculation.

The production and waste of bones, E. KRÜGER (*Jour. Landw., 53 (1905), No. 1, pp. 77-85*).—Statistics are given of the production, value, and utilization of bones derived from various sources in Germany. The author estimates a total annual production in Germany of 414,310 tons, and an annual waste of 299,835 tons, worth about $6,250,000.

On the influence of various ratios of phosphoric acid to nitrogen on the growth of barley, R. BAHADUR (*Bul. Col. Agr. Tokyo Imp. Univ., 6 (1905), No. 4, pp. 421-428, pl. 1*).—The author reviews the literature of investigations with reference to the proper ratio between phosphoric acid and nitrogen in a fertilizer for different crops, and reports pot experiments with barley, using varying proportions of these constituents.

It was found that although analysis of the barley grain indicated a ratio of 3 parts of nitrogen to 1 of phosphoric acid, a manure containing these constituents in this ratio did not produce the best results, indicating that physiological requirements of plants are not always identical with the fertilizer requirements. The experiments showed that the ratio of 1 part of phosphoric acid to 3 of nitrogen in the manure was not so favorable as the ratio 1:2.

On the action of the phosphoric acid in agricultural phosphate, O. BÖTTCHER (*Deut. Landw. Presse, 32 (1905), No. 20, p. 169*).—A critical review of Bachmann's experiments with the so-called agricultural phosphate (E. S. R., 16, p. 556).

Fertilizer experiments with low percentage and high percentage Thomas slag (*Deut. Landw. Presse, 32 (1905), No. 26, p. 232, figs. 2*).—Comparative tests of 8 per cent and 16 per cent Thomas slag on oats are reported, the results being decidedly in favor of the high-grade slag.

On the action of heavy applications of magnesia in the form of sulphate, T. NAKAMURA (*Landw. Jahrb., 34 (1905), No. 1, pp. 141-143, pl. 1*).—Pot experiments are reported with barley, on a soil naturally containing 17 times as much lime as magnesia soluble in strong hydrochloric acid, to which was added amounts of

magnesium sulphate varying from $\frac{1}{25}$ to $\frac{1}{3}$ of that required to make the magnesia content of the soil equal to its lime content. The amount making the magnesia content of the soil of each pot 88.82 gm. as against 170 gm. of lime, i. e., making the ratio approximately 2 of lime (CaO) to 1 of magnesia (MgO) gave the best results.

Inspection of fertilizers in 1904, F. W. MORSE (*New Hampshire Sta. Bul. 117, pp. 9–16*).—This bulletin gives the results of analyses of 119 brands of fertilizers inspected in cooperation with the State board of agriculture.

Commercial fertilizers, W. W. MILLER and N. W. LORD (*Offic. Rpt. Sec. Ohio State Bd. Agr. on Com. Ferts., 1904, pp. 88*).—This is a report on fertilizers licensed, inspected, and analyzed during the year 1904 under provisions of the Ohio State fertilizer law.

FIELD CROPS.

The breeding of agricultural plants, C. FRUWIRTH (*Die Züchtung der landwirtschaftlichen Kulturpflanzen. Berlin: Paul Parey, 1905, pp. XVIII+345, figs. 28*).—This work, when completed, will comprise 4 volumes. The first edition of volume 1 has been previously noted (E. S. R., 13, p. 243). The book here noted is the second and revised edition of volume 1.

The subject-matter as rearranged divides the volume into 2 parts, one treating of the theoretical basis of plant breeding and the other of the practical application of the theories put forth. In part 1 the author discusses sexual and asexual reproduction, transmission of characters, variation, and selection, and in part 2 he includes methods of selection and crossing, the use of asexual reproduction in connection with this work, and the management of plant-breeding establishments in general.

A brief historical review of the work in breeding agricultural plants concludes the volume. A bibliography of 59 works and articles and 31 periodicals frequently cited in the book is given.

The effect of dessication on the dimensions and volume of plant organs and tissues, M. BERTHELOT (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 21, pp. 825–834*).—Experiments were made with *Festuca pratensis*, wheat, maize, *Gynerium argenteum*, and paper. The samples were air dried and then subjected to a temperature of 110° C.

The length of the stems of Festuca was but slightly influenced by drying, but the change in the diameter was more marked, amounting to from 25 to 33 per cent when dried at 110°. The variations in the diameter of the stems were small as compared with the quantity of water driven off. After drying at 110° C. the diameter changed but slightly when the plant was exposed to the humidity of the air. The circular form of the stem was retained in all degrees of dryness. When the stems were soaked in pure alcohol a perceptible contraction resulted which, however, was smaller than the contraction caused by drying at the higher temperature. Washing the treated stems in distilled water brought them back to their original dimensions.

Wheat straw was changed but little in length by drying, but a temperature of 110° C. much reduced the diameter. When exposed to the air at ordinary temperature it resumed its original size. Air drying reduced the diameter of maize stems about as much as drying at 110°, while as in the other cases, the length was but little affected. In this case the stems were not restored to their original form upon exposition to the air under ordinary conditions. The stems of *Gynerium argenteum* behaved similar to those of Festuca. The leaves of this plant were reduced from one-fifth to one-third in thickness by drying, and the effect was permanent.

Changes in the dimensions and thickness of the different samples of paper subjected to drying were very small. The vascular system in the stems is considered as retaining its form and length when the plant substance undergoes drying, and to this phenomenon the small changes in the length of the stems are ascribed.

The roots of plants, A. M. Ten Eyck (*Kansas Sta. Bul. 127, pp. 197–252, figs. 26*).—Work along this line by the author has been previously noted (E. S. R., 12, p. 516).

In addition to observations on the root systems of corn, wheat, flax, and potatoes, which formed the basis of earlier work, this bulletin describes the root development of listed and level-planted corn, Kafir corn, sorghum, oats, barley, orchard grass, *Bromus inermis*, big blue stem, buffalo grass, Kentucky blue grass, clover, alfalfa, soy beans, cowpeas, sugar beets, and trees. The method of preparing the samples is described and illustrated. In summarizing the author points out the differences in the root systems of the different crops studied.

It was found that the roots of corn are more extensive than those of Kafir corn and sorghum. Kafir corn has a thick growth of surface roots, while the root system of sorghum has a greater resemblance to that of corn. The root system of listed corn had developed at a uniform depth, and the surface roots were uniformly deeper in the soil than in level-planted corn. The roots of wheat, oats, and barley did not spread out so far but went deeper into the soil than the roots of corn and other cultivated crops.

Oats and barley produced a large, fibrous growth of roots in the surface soil, but the largest growth of fibrous roots in the upper soil was made by the perennial grasses. Certain grasses also extended their roots deeper into the soil than any other class of crops except the perennial, leguminous plants. Alfalfa, the deepest rooted crop studied, showed only a small growth of fibrous roots near the surface, the principal root development being deeper in the soil. Cowpeas and soy beans appear to be light-rooting crops. The roots of flax, as well as those of potatoes, developed near the surface. The root system of the sugar beet lies comparatively deep.

The author cautions against cultivating so deep as to break the large lateral roots of corn lying at a depth of about 4 in. midway between the rows. As the roots of listed corn lie deeper, it may be cultivated close to the hill and 3 to 4 in. deep at the last cultivation without injury to the roots; while in level-planted corn, the roots rising nearly to the surface several inches from the hill are destroyed by close cultivation. Deep cultivation for the purpose of forming a thick soil mulch is recommended for late cultivation and laying by of corn in hot and dry climates. The root system of the potato requires shallow cultivation, while that of the sugar beet admits of deep cultivation.

Observations were also made to determine the effect of the different crops on the moisture content of the soil. Samples taken September 28, 1903, showed that soil on which a crop of broadcasted sorghum was produced contained on an average for 6 ft. in depth 3.51 per cent less moisture than corn ground, while soil having produced Kafir corn contained 2.88 per cent less. Soy bean soil showed a moisture content of 1.75 per cent greater than the corn soil. On March 14, 1904, another set of samples was taken for the same purpose and observations on 11 different crops were made. The largest amount of moisture in the soil was found on the ground which had produced cultivated crops in 1903, the corn ground ranking first and Kafir corn ground last. On the oats, wheat, barley, emmer, and flax plats the soil contained from 2.91 to 3.43 per cent less moisture than the soil of the corn plat, which showed a uniformly high percentage of moisture in each foot of soil.

The results of field experiments with farm crops, C. A. Zavitz (*Ontario Agr. Col. and Expt. Farm Bul. 140, pp. 62, dgm. 1*).—This bulletin describes the work of the experimental department of the college, presents statistics on areas of farm crops in Ontario, and reports in detail the results of the year.

The average annual yields of different crops in Ontario for the past 23 years are recorded as follows: Barley, 1,301 lbs.; winter wheat, 1,218; oats, 1,217; peas, 1,170; beans, 1,026; spring wheat, 942; buckwheat, 936, and rye, 913 lbs. These same crops, except beans, show an average considerably higher for the years 1902 to 1904,

inclusive, than for the 23 years, and the yields obtained in cooperative experiments during these 3 years are much higher than the general results for the province. The following results were obtained at the college in comparing the yields of field crops grown under similar conditions:

Average results with different field crops in six separate tests from 1902 to 1904, inclusive.

Crop.	Variety.	Date of ripening.	Height.	Rust.	Yield per acre.	
					Straw.	Grain.
			Inches.	*Per cent.*	*Tons.*	*Pounds.*
Barley	Mandscheuri	Aug. 5	40	9	2.0	2,714
Emmer	Common	Aug. 21	39	5	2.1	2,634
Oats	Joanette	Aug. 16	40	7	3.0	2,634
Hulless barley	Black	Aug. 6	31	13	2.1	2,473
Early oats	Alaska	Aug. 9	42	11	2.2	2,399
Hulless barley	White	Aug. 9	34	5	1.8	1,942
Spring wheat	Wild Goose	Aug. 29	48	13	2.2	1,716
Spring rye	Common	Aug. 16	51	4	2.1	1,536
Vetches	Spring	Sept. 12	38	....	2.0	....

Four six-rowed varieties of barley, Mandscheuri, Common six-rowed, Oderbrucker, and Mensury, grown for 15 years, have given an average yield of 71.4, 62.4, 64.4, and 60 bu. per acre, respectively. For the last 5 years the corresponding yields were 73.5, 68.7, 68, and 63.1 bu. Of 6 two-rowed varieties the average yields for 11 years were in favor of Two-rowed Canadian, New Zealand Chevalier, Jarman Selected Beardless, and French Chevalier. Two-rowed Canadian and Selected Canadian Thorpe gave the best yields of 17 varieties in 1904. The average yields of hulless barley for 5 successive years are as follows: Guy Mayle 54.4 bu., Black Hulless 51.5, Hungarian 50.2, Purple 49.2, and Winnepeg No. 2, 46.9 bu. The clover and alfalfa preceding barley in the rotation produced a much larger increase in crop than the grasses, there being a difference of nearly 12 bu. per acre between red clover sod and timothy sod. In 8 out of 12 years winter barley survived the winter and gave an average yield of 64.1 bu.

Joanette, Siberian, Waterloo, Oderbrucker, Probsteier, Bavarian, Egyptian, and Black Tartarian oats, mentioned in the decreasing order of yield, have been grown for 15 years in succession without change of seed and with average yields ranging from 71.1 to 90.5 bu. per acre. Of 78 varieties the following produced the greatest yield of grain in 1904: American Banner, Peerless, New Zealand, Irish Victor, Michigan Wonder, German Rust Proof, Black Gotham, Liberty, and The Great American. In weight of grain only Early Dawson, White Superior Scotch, Zhelannie, and Tobolsk weighed as high as 40 lbs. per measured bushel.

Seed selection has now been in progress for 12 successive years, and in 1904 the large plump seed produced 94.1 bu., the light seed 68 bu., and the hulled seed 91.6 bu. per acre. In the crop from the large and the light seed 1,390 and 2,095 grains, respectively, weighed an ounce. In using smutted oats 1, 2, 3, and 4 years old for seed it was found that as the seed increased in age the yield of oats decreased and the percentage of smutted heads increased. Timothy and clover sown with oats exerted but a very slight influence upon the yield. Winter oats have never been a success at the college.

The average weight per bushel and the average yield of the most productive varieties of winter wheat for the past 5 years, including 1904, were as follows: Dawson Golden Chaff 59.9 lbs. 59.8 bu., Imperial Amber 61.2 lbs. 58 bu., Prize Taker 59.8 lbs. 57.6 bu., Silver Dollar 59.7 lbs. 57 bu., Buda Pesth 61.4 lbs. 55.4 bu., Rudy 61.1 lbs. 55.4 bu., Forty-fold 59.1 lbs. 55.4 bu., and Egyptian Amber 61.4 lbs. 55.2 bu. In 1904 Dawson Golden Chaff possessed the strongest, and Red Hussar the weakest straw, and Ironclad, Tasmania Red, and Pride of America were freest from rust.

Six varieties of durum wheat, Wild Goose, Medeah, Sorentina, Bart Tremenia, Algiers, and Ontario, given in the decreasing order of productiveness, ranged in average yield for 6 years from 42.1 to 29 bu. per acre. Polish wheat in the average for 10 years yielded 22.1 bu. per acre as compared with 36.3 bu. for Wild Goose. For 3 years 3 principal varieties of emmer gave on the average higher yields of straw and much higher yields of grain than 3 leading varieties of spelt. The results of sowing these 2 crops on different dates in 1903 and 1904 show that spelt requires early sowing while emmer will also give good yields when sown from 2 to 3 weeks later than spelt.

Very ripe winter wheat used for seed gave a better yield of grain and straw than wheat harvested at any one of 4 earlier stages of maturity. The average results for several years were also in favor of large plump seed, the use of 1.5 bu. of seed per acre, sowing on September 1 to 10 as compared with sowing from September 10 to 20, and plowing under field peas as green manure as compared with plowing under buckwheat and working the land as a bare fallow. Winter wheat seed grown 1,000 miles south of Guelph gave practically the same results for 2 years as home-grown seed. On well-cultivated land there was little difference in the average yield of 16 tests in 8 years between drilling and broadcasting. In the average of 5 years' experiments untreated wheat had 368 smut balls per pound, while wheat treated with potassium sulphid, bluestone, and hot water had only 9, 2, and 1 smut balls, respectively.

Among the varieties of winter rye Mammoth and Common, and of spring rye Dakota Mammoth, Prolific Spring, and Common were most productive. Silver Hull buckwheat has given the best general results of several varieties under test. Based on experiments during the past 15 years, the following varieties of field peas are recommended: White Wonder for a very rich soil, Early Britain and New Canadian Beauty for a soil of medium quality, and Prussian Blue and Tall White Marrowfat for poor soils. The ravages of the pea weavil are discussed and methods for combating the insect are described.

The average yields for 3 years of the leading varieties of field beans were as follows: White Wonder 21.8, Pearce Improved Tree 21.3, Burlingame Medium 20.8, Medium or Navy 20.7, and Schofield 20.5 bu. per acre. Snowflake produced the heaviest grain, weighing 65.7 lbs. per bushel. Early Yellow soy bean proved to be a good grain producer and the Medium Green a satisfactory fodder crop. Horse beans did not give very satisfactory results and seemed to be unsuited for general cultivation throughout Ontario. The grass pea for a period of 7 years has given an average yield of 25.7 bu. of grain and 2.2 tons of straw per acre, but in 1904 it produced only 16.5 bu. Cowpeas have so far given unsatisfactory results. For 4 successive years hairy vetches sown in the fall have given an average yield of 8.6 bu. of seed per acre the following season. Alfalfa grown for seed production gave light yields in each of 6 years. Notes are also given on sorghum, millets, sunflowers, and flax grown for seed.

For 5 years spring wheat, barley, oats, and peas were sown on 6 dates one week apart, commencing as early as the land was dry enough for seeding. The greatest average yield of grain per acre was produced by the spring wheat and by the barley from the first, and by the oats and peas from the second date of sowing. The results show that for every day's delay in the seeding after the first week was past in which the seeding took place there was an average decrease of 56 lbs. of oats, 53 lbs. of barley, 29 lbs. of spring wheat, and 23 lbs. of peas per acre. Grains grown in mixtures for the production of grain and straw produced larger yields per acre than the same grains grown separately. Of the different mixtures, oats and barley gave the heaviest average yield of thrashed grain. A mixture of 1 bu. of oats and 1 bu. of barley proved most satisfactory.

Of 23 varieties of mangels tested for 5 years, Yellow Leviathan produced the heaviest average yield, 34.16 tons per acre. Sixteen varieties gave an average of

over 30 tons. Among the newer kinds the following produced the best yields in 1904: Criewen 29.9, Giant Eckendorf 28.1, and Rennie Golden Giant 24.6 tons. Soaking mangel seed for 12 hours before planting gave an apparent average increase for 2 years of 2.8 tons per acre. In the average results for 5 years Giant White Feeding stands first in yield of sugar beets with 25.32 tons per acre. Kirsche Ideal, another variety for feeding purposes, stood very high, with an average yield of 31.3 tons per acre for 3 years. An experiment in planting sugar beets at different distances between the rows, the plants standing at intervals of 7 in., showed a regular decrease in tonnage as the distance between the rows increased from 12 to 28 in. Similar results were obtained in rows 18 in. apart, with the distance between the plants in the row increasing from 2 to 10 in. Thinning when the plants were 2 in. high gave the best results. In 1903 the largest yield was obtained from seed soaked 12 hours, and in 1904 from seed soaked 24 hours.

The average yields for 5 years of 20 varieties of carrots ranged from 18.65 to 31.16 tons, the leading varieties being Mastadon White Intermediate, Mammoth Intermediate Smooth White, and Steele Improved Short White, all yielding over 30 tons per acre. The results of variety tests with swedes, turnips, parsnips, and kohl-rabi are also reported.

In the potato tests the following varieties grown for the past 5 years gave the highest average yields of sound tubers: Empire State 269, Seedling No. 230 256, Dempsey Seedling 252, Pearl of Savoy 251, White Elephant 251, American Wonder 247, Holborn Abundance 247, The Daisy 243, Rural New Yorker No. 2 243, and Rural Blush 240 bu. The results for 2 years show that the late varieties were, in general, freest from rot. The varieties having the least rot produced the largest yields of sound potatoes. A comparison of early varieties for 3 years resulted in the best yields at 9 weeks after planting from Early Andes, Early Dominion, Six Weeks, Early Fortune, and Early Dawn. Planting different sized sets at different distances apart in the rows gave the highest average yield for 3 years from 2-oz. sets 1 ft. apart, and the lowest from 1-oz. sets 2 ft. apart in the row. One 2-oz. set in the hill gave higher yields than 2 1-oz. or 4 ½-oz. sets. In 1904 the yield decreased as the size of tubers used for seed decreased. Planting in rows 26.4 in. apart with the sets placed at intervals of 1 ft. gave an average yield for 4 years of 179.6 bu. per acre as compared with 152.3 bu. for planting in squares 33 in. apart each way.

Of 103 varieties of fodder and silage corn grown in 1904, the largest yields of ears per acre were produced by the following kinds: Early Windsor Sweet 5.2 tons, Kendal Early Giant Sweet 5.2, Ringleader Sweet 5, and Wisconsin Beauty Sweet 4.9 tons. These varieties are all suitable for fodder, but not considered as valuable for silage as some of the dent corns. Mammoth Cuban, Mastadon Dent, and Leaming are considered valuable for both fodder and silage. Deep cultivation at first, followed by cultivation gradually getting shallower as the season advanced, proved most satisfactory and was closely followed in yield by shallow cultivation throughout the season. Results with grasses and other forage crops are also given.

Agricultural experiments, F. C. Henniker (*Rpt. Dept. Land Records and Agr. Assam, 1904, pp. 14–16*).—Of 12 varieties of potatoes Early Regent, Triumph, Harbinger, Magnum Bonum, and Flowerball, in the order given, were the most productive and gave satisfactory yields. Patna proved most disease-resistant and, with the other 5 varieties, is recommended for cultivation. Maize proved to be the most useful and economic forage crop and was also successfully made into silage.

Annual report on the experimental farms in the Bombay Presidency, F. Fletcher and J. B. Knight (*Ann. Rpt. Expt. Farms, Bombay Pres., 1904, pp. 82*).—The work and results of culture, fertilizer, and variety tests with cotton, wheat, rice, tobacco, grasses, leguminous crops, sweet potatoes, and yams on 9 experimental farms for the year ending March 31, 1904, are briefly described.

A discussion on the improvement of cotton by selection and crossing is presented, and the quality of fiber in the different types of crossbred cottons is noted. Of the 264 crosses obtained only 2 were selected for quality of fiber, and these show good results while all the others selected for yielding capacity have not yet had sufficient time to show their merits in this respect.

Field experiments conducted at the Cawnpore Farm (*Rpt. Cawnpore Farm and other Expt. Stas., United Prov., 1904, pp. 1–12, 14, 15*).—The results of fertilizer tests with maize and wheat, and of rotation and green manuring experiments, are tabulated without comment. Of 3 varieties of potatoes Madrasi White gave the best yields and was the quickest to germinate. Extra Early Waterloo Dent, Blount Prolific and King Philip field corn, and sweet corn imported from America did not prove superior to common native varieties.

Hope Experiment Station, W. FAWCETT (*Ann. Rpt. Pub. Gard. and Plantations, Jamaica, 1904, pp. 9–16*).—A culture test of Sea Island, Egyptian, and upland varieties of cotton is reported. Plantings were made every month and the best growth was obtained from those made in August, but the ratoons from plantings in February did even better. The plants grew best in rich heavy loams, but yielded best in light, gravelly soil. The best distance on rich soil was 4 by 3 ft. and on poor soil, 4 by 2 ft.

Havana and Sumatra tobacco were grown and a fine grade of wrapper secured. The climate was apparently too dry for the perfect curing of the tent-grown Sumatra leaf.

Report of the agricultural experiments during the crop year 1903-4, J. B. HARRISON (*Rpt. Agr. Work, Expt. Fields and Govt. Lab.* [*British Guiana*] *1903–4, pp. 53*).—The results of tests with seedling canes and fertilizer experiments with the same are recorded in tables. The data indicate that from 2 to 3 cwt. of sulphate of ammonia per acre is the most certainly profitable application of nitrogen for sugar cane.

Thomas slag and superphosphate of lime increased the yield of plant canes when given with nitrogen and potash. The use of potash produced little or no effect on ratoon crops. Lime largely increased the yield through the improvement of the mechanical condition of the soil resulting from its use. As in previous experiments, neither the addition of phosphoric acid, potash, or lime to the fertilizers affected the sugar content of the juice, while nitrogenous fertilizers retarded maturity and in consequence reduced the sugar content; which was, however, more than offset by a larger yield.

Cultural experiments with rice showed that varieties imported from Ceylon matured in 4 months, while the Creole variety required nearly 5 months. Experiments with cotton have so far shown that Sea Island and American upland varieties are grown with difficulty on heavy clay soils under the existing climatic conditions. Culture tests with alfalfa were unsuccessful.

Cooperative experiments in 1903, Z. YANUSHEVSKI (*Proc. Podolsk Agr. Soc., 1904, No. 1; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *5* (*1904*), *No. 5, pp. 681, 682*).—Fertilizer experiments with sugar beets on 6 different farms showed that in all cases phosphoric acid was the most effective element, while potash gave rather indefinite results but proved more active when applied with phosphates. Fertilizer experiments with wheat on 5 farms resulted in the best yields from potash salts and nitrate of soda applied separately. Phosphates gave only a slight increase.—P. FIREMAN.

Heavy and light weight grains, H. SNYDER (*Minnesota Sta. Bul. 90, pp. 214–218*).—The analyses of heavy and light weight seeds of barley, oats, and wheat are given in tables. The seeds were taken from the same variety and the same source, the heavy-weight seeds being sound, well-filled, high-weight kernels, and the light-weight seeds imperfectly-filled, low-weight kernels.

The results show that while the light-weight seeds contain a somewhat larger percentage of nitrogen, phosphoric acid, and potash than the heavy-weight seeds, the total amount of these substances is much less. One hundred kernels of heavy-weight barley contained about one-third more phosphoric acid, nearly one-half more nitrogen, and about 10 per cent more potash than 100 light-weight kernels, and in 3 samples of oats 100 heavy-weight kernels contained about 1.8 times as much phosphoric acid, 1.5 times as much potash, and nearly twice as much nitrogen as 100 light-weight seeds. About the same total amount of phosphoric acid and potash and twice as much nitrogen was found in 100 heavy-weight wheat kernels as in 100 light-weight seeds.

The germination and viability of frost-damaged grains, O. GLÄRUM (*Norges Landbr. Höiskoles Akervekstforsög 1902–3, pp. 79–96*).—A study of frost-damaged Grand Mogul, Ligowo, and Grenaa oats showed that the plumule had sustained the severest injury. If not killed by the frost, the plumule may lack the required energy to push to the surface of the soil and may be prevented from pushing upward by a divided, wrinkled, or bent condition resulting from frost injury.—F. W. WOLL.

Forage and pasture plants of Iceland, II, S. STEFÁNSON and H. G. SÖDERBAUM (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 5, pp. 324–368*).—A former report on this subject has been previously noted (E. S. R., 14, p. 432).

The moisture, ash, crude protein, ether extract, cellulose, pentosans, total and digestible albuminoid nitrogen, and indigestible albuminoid nitrogen content of the following plants is reported: *Poa annua, P. alpina, Glyceria distans, Calamagrostis neglecta, Nardus stricta, Anthoxanthum odoratum, Phleum alpinum, Juncus balticus, J. trifidus, Achillea millefolium, Trifolium repens, Vicia cracca, Rumex acetosa, Polygonum viviparum, Cerastium vulgare, Galium verum, Menyanthes trifoliata, Comarum palustre, Geum rivale, Leontodon autumnalis, Erigeron neglectus, Salix lanata, S. glauca, S. herbacea, Calluna vulgaris,* and *Loiseleuria procumbens.*—F. W. WOLL.

Alfalfa in Indiana, A. T. WIANCKO and M. L. FISHER (*Indiana Sta. Bul. 101, pp. 205–219*).—General directions for the culture and uses of alfalfa are given, and the results secured in cooperative culture tests are briefly reported.

The results showed that a good stand may be obtained on almost any of the soils of the State and that the more open soils are to be preferred. Inoculation proved desirable and in most cases necessary. Although not very definite, the results further indicated that alfalfa should be sown from early April to June, and that sowing without a nurse crop is preferable.

Reports from 38 farmers in various parts of the State show that with 32 the crop was a success. The causes of failure reported are weeds, need of inoculation, poor drainage, early pasturing, and drought after seeding.

Culture experiments with Imperial barley, 1901–1903, S. RHODIN (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 5, pp. 321–323*).—Four varieties of Imperial barley, Goldthorpe, Erh. Frederiksen, Webb Bearded, and Svalöf Primus, were grown for 3 years at the experiment station of the Swedish Agricultural Academy.

The highest average yield, 2,613 lbs. per acre, was produced by Svalöf Primus, followed by Frederiksen with an average yield of 2,529 lbs. per acre. Svalöf Primus also ranked first in quality, combining with the high yielding power a relatively low moisture, protein, and hull content and a high kernal weight.—F. W. WOLL.

Corn improvement in Indiana, A. T. WIANCKO (*Indiana Sta. Bul. 105, pp. 275–322, figs. 15*).—This bulletin discusses the selection and preparation of seed corn, including the tests for germination and vitality, and brings out by means of illustrations and notes the good and poor shape of the ears, variation and uniformity in the kernels, good and bad spacing of kernels at the cob, the proper width of the furrows between the rows, and desirable and undesirable types of kernels. The score card

for corn judging adopted by the Indiana Corn Growers' Association is presented, with an explanation of the different points.

The results of cooperative experiments in corn improvement are also reported. Twenty-one varieties tested in different sections of the State in 1903–4 showed considerable variation in yielding power. Experiments to increase the yield and to produce more uniform types are also in progress and the first season's results show very clearly the influence of individuality upon yielding capacity.

The effect of soil fertility upon the percentage of barren stalks was studied on ground that had been in corn continuously for 20 years and was badly run down. The experiments comprised 18 plats of 4 rows each, with 1, 2, 3, and 4 stalks per hill, respectively. The number of barren stalks ranged from 0.44 per cent in the 1-stalk rows to 9.89 per cent in the 4-stalk rows in 1903, and from 6.5 to 40.74 per cent, respectively, in 1904, when the soil was very dry at the time the ears were forming.

The percentage of good ears, as well as the percentage of ears to fodder, was in favor of the 2 thinner rates of planting. The progress made at the station in breeding 5 varieties of corn for higher feeding value is shown in a table. Considerable gains in the protein content of the seed were made during the first year, but the seed produced the second year showed a falling off in the average composition in all cases except one.

Suggestions for Missouri corn growers, M. F. Miller (*Missouri Sta. Circ. of Information 19, pp. 27, figs. 6*).—This bulletin is a popular discussion of the value of good seed corn, the proper care of seed corn, and the importance of using pure-bred corn. The characters of good seed ears are described, methods of corn breeding outlined, and directions for judging corn are given, with a description of the different points of the score card.

Second annual meeting of Missouri Corn Growers' Association (*Missouri State Bd. Agr. Mo. Bul. 4 (1905), No. 8, pp. 52, figs. 8*).—This bulletin is a partial report of the proceedings of this meeting, held under the auspices of the State Board of Agriculture and the agricultural college.

Papers on the following topics are reproduced: The work of our experiment stations on corn improvement, what the farmer may do in corn improvement, commercial fertilizers as supplements to barnyard manure and leguminous crops, Indian corn—from a practical farmer's point of view, corn pollination, the chemistry of corn, and the corn worm or bollworm. The Missouri corn score card is presented, with directions for judging.

The results of cooperative experiments with commercial fertilizers for corn and potatoes, discussed in one of the papers, show that applications of bone meal and blood were applied at a loss, while with the addition of sulphate of potash large profits were secured.

An overlooked forage plant of high value (Festuca arundinacea) (*Nord. Mejeri Tidn., 19 (1904), No. 31, pp. 415, 416*).—This is said to be especially valuable on alluvial clays rich in humus.—F. W. WOLL.

Light and dark colored flaxseed, H. Snyder (*Minnesota Sta. Bul. 90, pp. 226, 227*).—A test was made to determine the difference in the oil content of dark and light colored flaxseeds. The oil content of yellow-tinged, dark-brown, and light-brown flaxseed was 34.64, 36.09, and 35.10 per cent, respectively. The protein content in these samples ranged from 22.33 to 22.93 per cent. The germinating powers of the different colored samples and the quality of the oil extracted from them were practically the same.

Hop culture in Bohemia, R. Graas (*Arb. Deut. Sek. Landeskulturrates Königr. Böhmen, 1904, No. 7, pp. 102, figs. 20, dgms. 3, map 1*).—The history and statistics of Bohemian hop culture and a description of the hop plant, together with cultural directions, are given and means for the protection and promotion of the industry are

suggested. The chapter dealing especially with the culture of the hop treats of the following subjects: Soil, location, climate, new hop plantations, pruning and cultivation, training, use of fertilizers, injuries and their effects upon growth, yield, cost of production, and value of products.

Report on potato trials, 1903, H. JUHLIN-DANNFELT (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 1-2, pp. 95-162*).—A report on tests with 62 varieties of potatoes conducted in different parts of Sweden. The yield of tubers, the percentage of starch, the yield of starch per hectare, and the principal characteristics are given for each variety.—F. W. WOLL.

Experiments with potatoes on home-mixed fertilizers, C. D. WOODS (*Maine Sta. Bul. 112, pp. 13-21*).—The fertilizer requirements of the potato are discussed, and results obtained with home-mixed and factory-mixed fertilizers in cooperative potato culture tests are reported.

The formula used at Brunswick consisted of 500 lbs. of screened tankage, 200 lbs. of cotton-seed meal, 100 lbs. of nitrate of soda, 400 lbs. of acid phosphate, and 200 lbs. of sulphate of potash. No general comparison of the factory and home mixed fertilizers was made, but the latter gave satisfactory returns. The author believes that the modification suggested in Bulletin 107 of the station (E. S. R., 16, p. 657) would have been advantageous in most instances.

In a second locality the formula used for home-mixing contained 420 lbs. of screened tankage, 400 lbs. of acid phosphate, 200 lbs. of cotton-seed meal, 200 lbs. of sulphate of potash, and 100 lbs. of nitrate of soda. A comparison of the home-mixed and ready-mixed fertilizers was made. Large crops were in general secured from the home-mixed application, but the vines remained green and succulent later in the season and were more subject to frost than the crops receiving the ready-mixed fertilizers, which consequently produced larger and better ripened tubers. This result is considered due to too much slowly available nitrogen and too little available phosphoric acid in the home-mixed fertilizer. To remedy this condition the modifications referred to above are recommended.

Investigation of Swedish root crops, H. JUHLIN-DANNFELT and H. G. SÖDERBAUM (*K. Landt. Akad. Handl. och Tidskr., 43 (1904), No. 1-2, pp. 42-95*).—Comparative variety tests of carrots, mangels, kohl-rabi, and fodder beets grown in different counties of Sweden.—F. W. WOLL.

Report on experiment with varieties of swedes in 1902, W. BRUCE (*Edinburgh and East of Scotland Col. Agr. Bul. 1, pp. 24*).—Cooperative tests with 16 varieties of swedes were made on 5 farms.

The variety Queen stood first in tonnage and yield of dry matter as well as in value per acre. The yield of roots ranged from 20 tons 19 cwt. 72 lbs. to 26 tons 4 cwt. 27 lbs. per acre, and the yield of dry matter from 48 cwt. 101 lbs. to 63 cwt. 75 lbs. Queen ranked second in quality, while Springwood, although fourteenth in yield, ranked first by only a nominal margin. The author recommends that each farmer test several varieties to determine those best suited to his farm. The chemical composition of all varieties determined from samples grown at the different farms is shown in tables.

Proceedings of the first annual convention of the American Beet Sugar Association (*Proc. Ann. Conv. Amer. Beet Sugar Assoc., 1 (1904), pp. 105, figs. 6*).—Papers and discussions treating of diseases and insect enemies of the sugar beet, American-grown sugar-beet seed and beet seed production in general, soil adapted to the sugar beet, and the culture of the crop.

Unusual yields of rye, J. KÜHN (*Ber. Physiol. Lab. Landw. Inst. Halle, 1904, No. 17, pp. 8*).—A number of high yields of rye on record are mentioned, and a fertilizer experiment is reported in which a plat receiving a heavy dressing of barnyard manure yielded at the rate of 5,190 kg. of rye and 6,695 kg. of straw per hectare.

Wheat, J. N. Harper (*Kentucky Sta. Bul. 115, pp. 49–60*).—Field tests were made with a number of varieties of wheat and the yields obtained, together with other data, are shown in a table. Notes and descriptions of the different varieties are also given.

The wheat was sown October 21, 1903, at the rate of 6 pk. per acre in drills 7 in. apart. Canadian Hybrid ranked first in yield of grain and straw, with 47.2 bu. of grain and 4,480 lbs. of straw per acre, respectively. In yield of grain this variety was followed by Dawson Golden Chaff with 44.4, Pearl Prolific with 42.2, and Turkish Red with 40.2 bu. per acre. Pearl Prolific and Improved Rice ranked first in earliness, ripening June 21. All varieties were ripe by July 1.

Glutenous and starchy grains, H. Snyder (*Minnesota Sta. Bul. 90, pp. 219–225, pl. 1, fig. 1*).—Former work on the physical characteristics of glutenous and starchy wheats has been previously noted (E. S. R., 15, p. 1095). The results of additional determinations of protein in starchy and glutenous wheats, similar to those obtained in the earlier work, are here reported without further discussion.

The influence of the germ upon the nitrogen content was determined. With the germ removed the samples contained 0.56 per cent less protein than entire kernels, and the end of the kernel opposite the germ end contained 1.38 per cent less protein than the germ end. A study of separate heads disclosed differences in the nitrogen content of individual kernels grown from the same glutenous seed. The tabulated results show that the germ in 4 samples of heads from a uniform lot of seed contained an average of 14.57 per cent of protein on a dry-matter basis, the range being from 13.81 to 18.45 per cent. The protein content of glutenous and starchy kernels produced from the same head also showed small but appreciable differences.

Analyses of samples of starchy and glutenous kernels selected from Minnesota-grown corn showed differences ranging from 0.5 to nearly 1.5 per cent in protein content in favor of the glutenous kernels. It was observed that the glutenous kernels from the same lot of seed were, in general, of a darker hue than the starchy kernels, but in the samples of yellow and white corn analyzed the protein content showed no connection with the color.

In 6 samples of rye light and dark colored grains corresponding to hard glutenous and softer starchy kernels were readily distinguished. In 4 samples the average protein content in the starchy grain was 10.16 per cent and in the glutenous grain 10.91 per cent. The darker and more flinty kernels contained from 0.5 to 1.5 more protein than the lighter colored or more starchy ones. Greenish kernels had a high protein content. Tests made with oats showed that dark amber-colored flinty kernels were higher in protein than kernels of the light-colored starchy type selected from the same lot and grown from similar seed, while greenish kernels contained more than either. The protein in the different samples ranged from 10.98 to 14.68 per cent.

Rusted wheat, H. Snyder (*Minnesota Sta. Bul. 90, pp. 228–231*).—The effect of rust on the chemical composition of the grain and straw, the composition of straw subjected to different degrees of rust injury, and of rust-free straw, is given in the table below:

Composition of wheat straw samples.

Condition.	Water.	Ash.	Protein.	Fat.	Carbohydrates.	Crude fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Badly rusted	9.81	8.05	6.28	0.98	27.74	47.19
Do	7.74	6.03	6.94	.51	30.08	48.70
Not seriously rusted	8.46	6.73	5.06	.96	31.48	47.31
Very lightly rusted	9.22	6.44	4.38	.97	32.86	46.13
Slightly rusted	7.67	6.42	4.58	....	40.35	40.98
Rust free	8.32	6.78	3.77	1.16	42.29	37.68
Grain not well filled	7.22	6.68	6.19	1.05	36.15	42.71

Wheat from rusty plants contained a higher percentage of protein, fiber, and ash than some fully matured grain from rust-free plants grown under the same conditions. The percentage of carbohydrates was highest in the sound samples. Some of the rusted wheat samples contained as high as 19.30 per cent of protein.

The effect of rust on the straw and grain of wheat, F. T. Shutt (*Jour. Amer. Chem. Soc., 27 (1905), No. 4, pp. 366–369*).—The data reported have been noted from another publication (E. S. R., 16, p. 585).

Wheat and barley from Madagascar, Balland (*Jour. Pharm. et Chim., 6. ser., 19 (1904), pp. 377–381; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, p. 753*).—Analyses are reported.

HORTICULTURE.

Another hardy garden book, Helena R. Ely (*New York: Macmillan Co., 1905, pp. XV+243, pls. 49*).—An entertaining account of the culture of vegetables, fruits, trees, shrubs, and flowers in the home garden, written in a popular manner and based on the author's personal experience. The book does not pretend to be exhaustive. Its purpose is to awaken interest in this healthful work.

Firminger's manual of gardening for India, J. Cameron (*Calcutta: Thacker, Spink & Co., 1904, 5. ed., pp. XIX+710, pls. 3, figs. 40*).—This book, first published in 1863, has been enlarged and revised to meet the needs of Southern India and other adjacent parts of the country. The work takes up in different chapters the operations of gardening and the culture of vegetables, fruits, and flowers.

Department of horticulture, L. B. Judson (*Idaho Sta. Rpt. 1904, pp. 11–26, figs. 6*).—A brief survey is given of work along different lines carried on at the station during the year with some details relative to the culture of mushrooms and string beans under glass. A spot disease affecting Jonathan apples is noted. The disease affects simply the skin of the apple and no trace of fungi has been found connected with it. The only apparent harm is the detracting appearance of the fruit. A disease called "Apple Rosette" is under observation. The disease is characterized by the failure of the lateral buds along infested branches to develop normal leaves.

In the experiment with mushrooms under glass, the spawn of the American varieties Alaska and Bohemia was compared with English spawn, in a small bed under the greenhouse bench. The Bohemia variety yielded 47 mushrooms, weighing a total of 15.75 oz.; Alaska 26 mushrooms, weighing 8 oz., and the English 48 mushrooms, weighing 19.5 oz.

In the bean experiment, the varieties tested were Early Warwick, Stringless Green Pod, and Triumph of the Frames. The yields obtained from these different varieties are tabulated and illustration given of the pods. The beans were affected with bacteriosis and after the first crop had been harvested finely powdered copper sulphate was worked into the soil of one section to see if it would check the disease, but without apparent effect. Shearing off the diseased portion of the plants as soon as the bacteriosis began to show was apparently of some benefit. The use of fertilizers in this experiment was apparently without benefit.

Cooperative tests in 1904 of peas, beans, sweet corn, and cabbage, N. E. Hansen, V. Fulkerson, and E. G. Sanderson (*South Dakota Sta. Bul. 91, pp. 22*).—The experiments here recorded were conducted in cooperation with this Department. Cultural tests were made of a large number of varieties of peas, sweet corn, cabbage, and bush, pole, and Lima beans. In the case of the peas and beans cooking tests were also made.

The results secured in the case of the peas are given in a somewhat elaborate table, showing the kind of stock used, height of the vines, dates of first picking, number of pods on the vines, number of peas in the pod, average length of pods, shape, size, time required for cooking, color, sweetness, flavor, juiciness, hardness, etc. The cul-

tural tests were carried out on a rich, black, somewhat sandy loam, underlaid at about 2 ft. with bowlder clay. The season was favorable.

Of the earliest peas a number of sorts were equally valuable. Extra Early Alpha appeared to be the best in quality. Of the second early recommended Thomas Laxton is mentioned first; of the midseason, Sherwood and British Wonder are mentioned first, and of the late sorts the variety Perhaps is first named. Good early varieties of bush beans were the Long Yellow Six Weeks and the Round Yellow Six Weeks, these 2 varieties being among the most prolific. Sutton Plentiful was of better quality. One of the most prolific of the later green podded varieties was the Canadian Wonder. Twelve varieties of Mexican beans were grown, but the season proved too short for them. Of 27 varieties of pole beans grown only 7 reached maturity. Most of the Limas tested required too long a season to mature at the station. Horticultural Lima was nearly a month earlier than any of the other varieties.

Extra Early Adams sweet corn reached maturity in 84 days. Of 38 varieties of sweet corn tested only 15 reached maturity. Special attention is called to the variety of sweet corn Malakoff imported from Russia by this Department through Professor Hansen in 1897. This is a small very early variety and promising on account of its earliness and good quality. Details of the tests of cabbages are omitted.

Onion culture, F. García (*New Mexico Sta. Bul. 52, pp. 32, figs. 10*).—Investigations covering the results of different cultural methods, tests of the keeping qualities of varieties, cost of onion production, and tests of varieties are reported.

In the culture test the relative merits of field planting and transplanting were compared. Practically all the onions now grown in the Territory are from seed sown in the field. This method is not entirely satisfactory because of the tendency of the soils to run together and pack when irrigated. This delays germination and usually results in a poor stand. Somewhat better results are secured when the seed is planted on the sides of ridges and furrow irrigation practiced. By this method care must be taken that the water does not cover the seeds on the ridges, otherwise the difficulty of germination and growth will be as great as when grown in plats. In field culture from 4 to 6 lbs. of seed to the acre is required, and the seed is sown about 1 in. deep and irrigated immediately afterwards to start germination. The cost of thinning onions in the field was found to be about $41 per acre.

When onions are grown in a seed bed and transplanted to the field it requires only 3 to 4.5 lbs. of seed per acre. The field is best prepared at transplanting time. It was found better to transplant the latter part of February or fore part of March, even if the onions were only half as large as a lead pencil, than to wait until later in the season. A boy can drop the onions for about 3 planters. A good planter will set 5,000 plants per day. With hand cultivation the rows should be about 15 in. apart and the onions set 4 to 4.5 in. distant in the row, but with horse cultivation the rows should be about 30 in. apart. The average estimated cost for transplanting during 3 years has been $29.33 per acre, which is considerably less than the cost of thinning onions in the field.

As soon as the onions are set in the field they are irrigated, and this is followed by a second irrigation 7 to 8 days later. From then on irrigation is given every 8 to 12 days with cultivation between each 2 irrigations. Light and frequent irrigations are preferred to heavy irrigations at long intervals. Good results were secured when very muddy water was used for irrigating purposes. Hand cultivation is considered preferable to horse cultivation since twice as many onions can be grown in the same area with practically the same cost.

The yield of different varieties in 1903 without fertilizers was at the rate of 32,000 lbs. per acre for Red Victoria and 29,000 lbs. for Prize Taker. In 1904 Gigantic Gibraltar without fertilizer yielded at the rate of 31,250 lbs. per acre and with sodium nitrate at the rate of 600 lbs. per acre 40,450 lbs. per acre. The cost of production varied from $107 per acre in 1902 to $111.75 per acre in 1904 without fertilizers.

Relative to varieties, the Red Victoria has given the best yields of any varieties tested on unfertilized soils. It is a medium keeper. The Prize Taker and Gigantic Gibraltar also yield well and in addition are good keepers. The Gigantic Gibraltar is considered preferable to the other two mentioned. The Australian Brown proved especially satisfactory as a late-keeping variety. It ripens early and is a sure cropper, though it does not yield as heavily as the other varieties mentioned. Neither insect pests nor fungus diseases have as yet been observed to seriously affect onions at the station.

The author found that if onions receive a check in growth when near maturity and then start into a second growth, as the result of irrigation or cultivation, there is a tendency for the bulbs to divide into 2 or more parts, which injures them for commercial or keeping purposes. The station experiments indicate that if onions stop growing shortly before ripening it is not advisable to irrigate them after that. The bulbs should be harvested, even though they are somewhat immature.

A table is given showing the keeping qualities of 28 varieties grown in 1902 and 1903. The best keeping varieties lost less in weight than the poor keeping kinds. The loss in weight is not from decay, but comes from evaporation, scaling off, and sprouting. Small specimens tended to keep longer than larger ones of the same variety. The best keeping varieties during the 2 seasons were Australian Brown, American Prize Taker, Australian Yellow Globe, Extra Early Red, Gigantic Gibraltar, Large White Globe, Philadelphia Silver Skin, and Round Yellow Danvers. Brief descriptions are given of 29 varieties.

In the Rio Grande Valley the variety which has long been grown to perfection is the El Paso onion, which is of the Spanish type. Even this variety, however, is now but little grown, and most of the onions consumed in the Territory are imported from California or elsewhere.

A Spanish edition of this bulletin has also been issued.

Early cantaloupes, P. K. Blinn (*Colorado Sta. Bul. 95, pp. 8, pls. 2*).—A discussion based on experience at the station of such factors in the production of early cantaloupes as seed, soil, cultivation, irrigation, etc. Only the best seed, of ideal type and quality, having early tendencies, should be planted. A fertile sandy loam soil in an ashy, mellow condition gives the earliest melons. As far as experiments have gone barnyard manure or alfalfa sod give better results than commercial fertilizers. "Alfalfa sod affords ideal soil conditions for cantaloupes, both in early production and in securing a big yield."

Generally, cantaloupes do not give early crops after beets, but if the land is not too much exhausted very satisfactory late crops may be secured. The use of commercial fertilizers in or under the hills at planting time has been found extremely hazardous, as the melon plants died when the roots came in contact with the caustic elements of the fertilizer. It is considered essential that growth be continuous from start to finish.

A quick germination of the seed with rapid development of large cotyledons is a promise of early crops. Any check to growth is likely to result in the production of melons below standard size. The weather records at Rocky Ford indicate that for 9 seasons out of 15 killing frosts have occurred the latter part of April and first of May. May 1 is considered plenty early to plant cantaloupe seed.

A study of the root system of the cantaloupe shows that when the seed germinates the main root penetrates almost directly down from the seed. Lateral roots arise from this main root about the time the fifth leaf appears or 4 or 5 weeks after germination. These roots seem to form the main feeders which develop the plant, for the development of a hill of melons "is practically insignificant until it feels the impulse of this larger and better root system. The question of early cantaloupes almost hinges on the success of the farmer in supplying conditions that will favor early development of the lateral root system."

The seeds should not be planted over 2 in. deep. Plenty should be used and the plants thinned to 2 or 3 of the thriftiest in the hill by pinching or cutting off. Pulling may destroy the remaining plants. Hoeing is of great importance, but it should be shallow. Lumps should be removed from around the hill and fine, moist, mellow soil hilled up around the plants. This helps protect them from wind and insects and also holds the moisture well up on the stem of the plant, which affords the best conditions for a long base and early growth of the main root system. Cultivation in the middle of the rows may be deep but near the hills should be shallow.

Irrigation water should be applied in furrows and not allowed to flood the ground. Just enough water should be applied for an even, healthy growth. An excess of irrigation during July is likely to develop vines at the expense of early fruit and also favors the development of rust.

Successful fruit culture, S. T. MAYNARD (*New York: Orange Judd Co., 1905, pp. XII+274, figs. 133*).—This is a practical treatise on the culture of all of the usual orchard and small fruits, including cranberry, blueberry, and subtropical fruits, with chapters on the propagation of fruit trees and plants, culture of fruits under glass, insect pests, and fungus diseases. The work is somewhat similar in plan to that issued by the author in 1885, entitled "The Practical Fruit Grower."

Fruit culture in Bohemia, H. FORT (*Der Obstbau im Tätigkeitsgebiete der böhm. Sektion des Landeskulturrates für das Königreich Böhmen. Prague: Anton Purkrábek, 1904, pp. 39, pls. 4*).—An account of the historical development of the fruit industry and of the climatic conditions of different fruit districts of Bohemia. The present status of orchard fruit production in Bohemia with statistics of production and a bibliography of 58 papers on Bohemian fruit culture are given.

Review of the fruit seasons (*Bien. Rpt. Comr. Hort. California, 1903–4, pp. 53–75*).—Statistics are given of the shipment of fruits, nuts, and dried fruits produced in California in the years 1903 and 1904. Tables are also given of the number of fruit trees growing in California in the spring of 1904 in each of the different counties.

Fruit culture in Scotland, J. M. HODGE (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 96–102*).—Statistics are given on the fruit production of Scotland.

Biennial Report of Missouri State Fruit Experiment Station (*Missouri Fruit Sta. Rpt. 1903–4, pp. 12, pls. 12*).—This report is made up essentially of an account, by the manager of the State Fruit Experiment Station at Mountain Grove, of the work which is being carried on at the station in the culture of different fruits with a list of the publications issued during the year and a financial statement.

In the variety-testing orchards there are at present 468 varieties of apples, 317 of peaches, 94 of plums, 65 of pears, 151 of grapes, and 150 of strawberries. Three trees of each variety of fruit are grown. In addition there is an orchard of 895 seedling apple trees and 175 seedling peach trees. Plates are given showing the development of the orchard at the station for each of the years 1899 to 1904.

Foreign markets for American fruits (*U. S. Dept. Com. and Labor, Spec. Consular Rpts., 32 (1904), pp. 218*).—This is a compilation of the replies received from United States consuls in the different cities of the world relative to American fruits sold in such cities.

Information is given as to the methods followed in the different cities in purchasing American fruits, that is, whether purchases are made direct or through commission houses in New York or at foreign ports, terms of payment, whether deliveries of American fruits are made with satisfactory promptness, and whether there are any objections to present methods of packing, with suggestions on how the trade might be increased.

In addition, statistics are given on the fruit trade of the United States, the United Kingdom, Germany, France, and the Dominion of Canada as to imports, exports, and reexports.

Marketing California fruits in Europe (*Bien. Rpt. Comr. Hort. California, 1903–4, pp. 146–151*).—This account is made up of reports of a number of European consuls on the use of California fruit in different sections of Europe.

An experimental shipment of fruit to Winnipeg, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Bul. 139, pp. 24, figs. 10*).—An account of this shipment has been abstracted from another source (E. S. R., 16, p. 876).

The apple in California, F. FEMMONS (*Bien. Rpt. Comr. Hort. California, 1903–4, pp. 136–145*).—An account of apple culture in the different sections of California, with descriptions of varieties which give the best results in different sections.

Apple growing in Indiana, J. TROOP (*Indiana Sta. Bul. 102, pp. 223–254, figs. 10*).—Popular directions are given for the culture of apples in Indiana, including spraying.

Experiments at the station in root-pruning trees show that trees root-pruned according to the Stringfellow method and planted in the fall have made a better root system and have produced from one-fourth to one-third more growth of top during the first season than trees planted in the usual way. In studying the reciprocal influence of stock and scion no difference either in size, color, or flavor could be detected as a result of this practice when scions of the Yellow Transparent apple were inserted into the branches of the Wild Crab. This work has been noted previously (E. S. R., 16, p. 772).

Apple production in Virginia, W. B. ALWOOD (*Virginia Sta. Bul. 151, pp. 37–58, maps 3*).—Statistics are given of the production of apples in each of the counties of Virginia for each of the years 1899 to 1903, inclusive, and also of the shipment of apples from the principal stations along each of the different lines of railroad within the State in 1901 and 1903, and indications made as to the destination of the shipment.

During the 5 years covered by the statistical data Frederick County has stood first in total production. In the Piedmont section Albemarle County leads. This bulletin has been compiled through cooperation with the station agents along the different lines of railroad, who have reported to the author monthly. An earlier bulletin, containing similar data, has been published by the station (E. S. R., 12, p. 445).

The Fall Beauty, a new apple originating in Kentucky, H. GARMAN (*Kentucky Sta. Bul. 116, pp. 82–84, pls. 2*).—An historical and descriptive account is given of an apple grown in the orchard of O. Piper, of Clinton, Hickman County, Ky., and named by him the Fall Beauty. The description is accompanied by plate illustrations of the fruit.

The apples submitted for examination weighed nearly one-half pound each and varied from 2.72 in. to 3.44 in. in diameter. The fruit ripens in September and is a good cooking as well as good dessert apple. The color is a deep purplish red, sometimes striped with yellow and ocher-yellow dots. The flesh is white at first, becoming creamy when thoroughly ripe. The history of the apple shows it to be of rather uncertain origin.

Value of pollination in the culture of the apple, and some of the reasons why flowers do not set, A. N. JUDD (*Bien. Rpt. Comr. Hort. California, 1903–4, pp. 212–217, figs. 4*).—The mixing of varieties in the orchard is urged by the author not only because many sorts are self-sterile, but because the fruit thus produced is larger and better. He suggests that in orchard planting the varieties be alternated in the rows both ways. By this method the varieties will row on the angle so that the picking of the fruit in separate varieties is not interfered with.

Pruning the apple orchard, L. B. JUDSON (*Idaho Sta. Bul. 47, pp. 36, figs. 19*).—Popular directions based to a large extent on experiments at the station are given for the pruning of apple trees with numerous explanatory illustrations. A critical discussion is given of various shears, saws, etc., used for pruning purposes.

It is believed that the effect of annual winter pruning is to give the tree a tendency to produce wood rather than fruit, while the effect of summer pruning is to produce fruit. Summer pruning, however, is seldom practiced because of the rush of other work at that time. It is believed to be out of the question for large orchards. Pruning to an open-centered vase or goblet form is recommended. Illustrations are given showing the effect of pruning shoots back to stubs on the inside of the tree at different times during the year. When the shoots were pruned back in winter to 2 or 3 buds, these buds the following spring developed into other shoots, making the trees more dense than ever.

The results were about the same when the trees were pruned in May. When the trees were pruned in August, however, there was a tendency on the part of the stubs left to form fruit buds instead of developing into shoots. The author states in this connection that "if the tree is shy in bearing and makes a rank growth of wood, it should be pruned heavily in midsummer."

Top grafting nursery apple trees, C. P. Close (*Delaware Sta. Bul. 69, pp. 7, 8, figs. 2*).—An account is given of top grafting nursery trees.

It was desired to start an apple orchard of summer varieties. As a fine lot of Northwestern Greening trees could be obtained at a reasonable price it was decided to top graft these with summer varieties before planting. In this work from 3 to 6 of the strongest best arranged limbs were pruned back to stubs 2 to 3 in. long and these stubs whip grafted with scions of July and Williams. All other branches on the trees were removed. The grafts were wound with waxed cord and painted over with liquid grafting wax, including the end of the scions so that all cut surfaces were covered. The roots of the trees were pruned back to 3 or 4 in. in length just before the grafting was done and set in the orchard as soon as grafted.

About 90 per cent of the grafts made good unions and grew well throughout the season. Where a scion failed to live, a shoot was usually pushed out on the spur and this was budded to the desired variety. The author believes that this method of top grafting nursery stock may be of special value when trees of the desired varieties can not be obtained or are weak growers with tender trunks.

It is suggested, also, that the surplus of strong healthy trees which nurserymen sometimes accumulate might profitably be handled in this way instead of being burned. These trees could be sold at a moderate price and a fruit grower could graft them to any variety he desired.

The composition of cider as determined by dominant fermentation with pure yeasts, W. B. Alwood, R. J. Davidson, and W. A. P. Moncure (*Virginia Sta. Bul. 150, pp. 33*).—The experiments recorded in this bulletin were carried out in cooperation with the Bureau of Chemistry of this Department and have been previously noted (E. S. R., 16, p. 668).

The peach industry in south Missouri, P. Evans (*Missouri Fruit Sta. Bul. 12, pp. 14, pls. 8*).—An account is given of the development and present status of the peach industry in south Missouri, with suggestions on the location of orchards in those regions, the varieties to plant, and the planting, care, and cultivation of the peach orchard.

The localities which at present appear to be particularly adapted to peach growing lie, one in the southeastern part of the State, comprising limited areas in Howell, Oregon, Shannon, Carter, and Ripley counties, and another in the extreme southwestern part, including small portions of Newton, McDonald, Lawrence, and Barry counties. Southern Missouri seems to be well adapted to peach growing, since growers are able to market their fruit just after the southern crop matures and before the northern crop comes on the market, the only rivals at this time being the peaches from Delaware and Oklahoma. Most of the fruit in southern Missouri is sent to eastern and northern markets.

The Elberta is the chief commercial variety grown in the section. Varieties maturing earlier than the Elberta are not profitable except for home trade. A number of other varieties, however, do well in southern Missouri. For the home orchard the following varieties mentioned in the order named may be grown: Mountain Rose, Reeves, Reynolds, Early Crawford, Gold Dust, Salway, Heath Cling, and Piquet Late. Good varieties of peaches for commercial purposes must be freestones with yellow meat, red blush, and medium and even in size in order to make a uniform, neat, and attractive package.

Among the better sorts for this purpose Mountain Rose, Reynolds, Elberta, Salway, and Piquet Late are mentioned. Among the new varieties which are believed to be desirable for southern Missouri conditions Reynolds and one or two seedlings are mentioned. The illustrations show different varieties of peaches, different methods of cultivating orchards, and orchards grown on very stony land.

The plum in Georgia, H. N. Starnes (*Georgia Sta. Bul. 67, pp. 237–285, pls. 4, figs. 63*).—An account of the culture of European and native plums in Georgia, with descriptions of the insects and diseases affecting these plums and remedies for their control, descriptions of a large number of varieties that have been grown at the station, and tables showing the dates of blooming and fruiting, period of ripening, etc.

Georgia contains about 900,000 plum trees, the larger proportion of which are located in the counties of Telfair, Houston, and Macon. The lack of a market and of suitable varieties has thus far limited the culture of plums within the State. None of the European varieties of plums succeed in Georgia and only a few of the native American varieties. The soil required is similar to that required for the peach, except that it must be of better grade. Marianna and peach stock have been found equally satisfactory as stocks for propagating such varieties as succeed within the State.

In setting out trees the roots may be pruned back to about 5 in. in length. The distribution of about 3 lbs. of cotton-seed meal broadcast about each tree over a circular area of some 6 or 7 ft. in diameter is recommended at the time the tree is set out. The second year in the orchard a cotton-seed formula analyzing 2 to 3 per cent nitrogen, 8 per cent phosphoric acid, and 2 per cent potash, and applied at the rate of 4 lbs. per tree is considered sufficient. The third year each tree should receive 3 lbs. of acid phosphate, 1 lb. of muriate of potash, and 1 lb. of cotton-seed meal.

Of all the American plums grown at the station the variety Hanson is the only one that has proved satisfactory. With this variety Smith is recommended as a pollinator. The best of the native plums, however, for the State and the only plums, with the exception of the Japanese, which the author considers worthy of commercial culture in Georgia, belong to the Hortulana group. Of these Clifford and Wilder are the most valuable. The Clifford variety, on account of its self-sterility, should be planted in company with Munson, and the Wilder with Milton for pollinating purposes. The Clifford ripens about a month before the Wilder.

The proportion in which the varieties should be used as pollinators in the orchard has not been determined, but in the author's opinion should not be less than 1 in 10 and in localities where few bees are kept the proportion might be increased to 1 in 7 or even 1 in 5 trees. The order of maturing of 60 varieties grown at the station is given in tabular form and these varieties are described with numerous illustrations.

Strawberries at Troupe Station, E. C. Green (*Texas Sta. Bul. 72, pp. 15, fig. 1*).—An account of variety and shipping tests of strawberries grown at the Troupe Substation in East Texas.

The author states that while some communities grow and ship strawberries in carloads, in other communities the fruit is scarcely grown at all. It is believed, however, that the fruit can be grown anywhere in East Texas with less expense and greater profit than can tomatoes. At the substation 51 varieties of strawberries were

tested during the season of 1902–3. The variety plats were small, the whole number occupying only one-fifth of an acre. From this area, however, the yield was at the rate of 204 24-qt. crates per acre.

A table is given showing the percentage of perfect stand and the total yield in quarts of each variety, date of first picking, and period of greatest production. Brief descriptive notes are also given of the different varieties. Varieties of proven value in the district for distant market are Excelsior and Lady Thompson for early, and Aroma and Haverland for midseason. The variety Klondyke is another early variety which promises much for distant markets. Barton Eclipse is promising as a late market variety. For the home table Johnson Early and Darling are good early varieties and Haverland, Aroma, and Wm. Belt are good medium to late varieties.

In the shipping test a number of varieties were shipped by express to points in Missouri. "The berries were picked early in the morning, boxed and crated as though for home market, no attempt being made to pick with special reference to long shipment." Part of the fruit was sent on a fast morning train and the remainder held at the packing shed and sent by the night express. In one shipment 13 varieties were sent and in the other 8 varieties. The results are tabulated for each variety as regards general appearance, percentage of decay, and quality of fruit. They indicate that Haverland is a first-class shipper and that Aroma, Barton Eclipse, and Mexican are satisfactory.

The bulletin is concluded with brief popular directions for the culture of strawberries in the district.

The symbiosis of grape species in grafting; an experiment for the solution of the question of the existence of graft-hybrids, W. Voss (*Landw. Jahrb., 33 (1904), No. 6, pp. 961–996, pls. 2, figs. 6*).—A comprehensive review is given of the graft-hybrids which have been reported by different authors with a critical examination of the same and an account of some experiments by the author to determine with species of grapes whether hybrid characters develop in tissue formed only after the union and whether the cells which bring about the union are of a hybrid character.

After considering the whole question from the standpoint of reserve material, coloring material, bouquet, geotropism, method of leaf unfolding, pubescence, outer form of the leaf, and susceptibility to attacks from parasites, the conclusion is drawn that graft-hybrids from the standpoint in which the subject was considered do not occur. A bibliography of 56 papers on the subject is included.

Smith's chrysanthemum manual, E. D. Smith (*Adrian, Mich.: Nathan Smith & Son, 1904, pp. 78, figs. 19*).—A popular account of the history, methods of propagation, cultivation, and training of chrysanthemums, special attention being given to the production of exhibition blooms.

The book of the lily, W. Goldring (*London and New York: John Lane, 1905, pp. X+98, pls. 18*).—A synopsis is given of the genus Lilium and descriptive and cultural notes of species and varieties with full directions for the culture of lilies and their uses under different conditions. This is Volume 17 of the series of Handbooks of Practical Gardening, edited by H. Roberts.

A manual on the propagation and cultivation of the peony, C. S. Harrison (*York, Nebr.: Author [1904], pp. 64, pls. 16*).—A popular account of the culture of this flower with descriptions of a large number of varieties. Letters from S. A. Bedford, Manitoba, and N. E. Hansen, South Dakota, are quoted, which show the hardiness of this flower in those regions.

The school garden, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 218, pp. 40, figs. 33*).—Suggestions for field and laboratory experimental garden work, which may be undertaken in country and city schools, are given in considerable detail, with numerous illustrations. Special attention is given to different methods of plant propagation, soils, and the laying out and planting of school grounds and gardens.

FORESTRY.

Forestry, A. SCHWAPPACH, trans. by F. STORY (*London: J. M. Dent & Co., 1904, pp. 158, figs. 30*).—This is a translation of Schwappach's Science of Forestry, in which all matter of strictly local application to Germany is omitted and those portions related to the sowing of forest seed, planting, insects, fungi, and forest management have been extended.

The different topics presented are a historical sketch of the development of forestry, forest statistics, forest influences, sylviculture, forest protection, forest utilization, forest management, forest finance, and forest economics. The work, while greatly condensed, will be found to discuss the principal features relating to forestry and forest management.

Forestry investigations, W. J. GREEN and C. W. WAID (*Ohio Sta. Bul. 158, pp. 135–164, figs. 10*).—The experiment station in Ohio has taken up the subject of forestry investigations, and in the present bulletin an account is given of some trees suitable for planting for posts, poles, and ties, with cultural suggestions and financial possibilities. For the present the investigations of the station will be confined chiefly to a consideration of the problems presented in this bulletin. Among the trees suitable for these purposes are osage orange, mulberry, black or yellow locust, and hardy catalpa. A number of plantations of locust and catalpa are described in which the peculiarities of growth of the different species are shown.

In one plantation of locust trees serious injury has been experienced by attacks of the locust tree borer, while in a second plantation where the trees were given more space and planted on richer soil, so that rapid, healthy growth was secured, there was very little injury noted.

Suggestions are given for growing the different species enumerated above, in which descriptions are given of the methods of handling the seed and seedlings, cultivation of the trees, distance of planting, and subsequent treatment.

In estimating the returns, the authors claim that, based upon 8 groves from 21 to 25 years old, the annual return for the hardy catalpa is on the average $10.30 per acre. This does not include the first cost, rent of land, or interest on the investment. A single estimate made of a locust grove 19 years old shows that the growth has been more rapid and the value of the production has been at the rate of $17.98 per acre annually for the entire period.

Fourth annual report of the State board of forestry, W. H. FREEMAN (*Ann. Rpt. Ind. State Bd. Forestry, 4 (1904), pp. 79, figs. 17*).—A report is made of the operations carried on at the forest reservation and experiment station in Clark County, Ind., in which an account is given of the methods of treating and planting seeds, forest cultivation, tree planting, improvements, etc.

Pure and mixed plantings were made of black walnut, chestnut, shellbark hickory, and white oak, as well as a few other species, in all about 100 acres being planted. In the forest, which is now under the management of the State board, the work of cultivating has been begun, and about 80 acres was gone over during the summer. All inferior trees and worthless species were cut out and the trees which were left standing were pruned so as to secure the best development. There remain about 1,200 acres uncultivated, together with about 400 acres which will have to be replanted.

Estimates are given as to the probable expenditures required to put in condition and protect the State forest reservation. The relations of forestry to lumbermen and the perpetuation and management of the farm woodlot are discussed, after which accounts are given of a black locust plantation of 15,500 trees and a catalpa planting of about 20,000 trees. The black locust planting was made of seedling trees 1 year old. These were rapidly planted by thrusting a stake into the ground and into the hole the roots of the young seedling were thrust and the ground pressed about

them. At the end of the second season's growth the trees are said to have averaged 10 ft. in height.

The planting of catalpas was made in Marshall County on land valued at $100 to $125 per acre for agricultural purposes. The beginning of the plantation was made in 1902 and continued in 1903 and 1904, the hardy catalpa being used. The older trees have been cut back to stumps so as to secure a single straight shoot, and this method is recommended by the writer for the handling of catalpa for timber production.

The report concludes with articles on The Relation of Forests to Stream Flow, by J. W. Toumey, and Recent Progress in Timber Preservation, by H. von Schrenk, reprinted from U. S. Department of Agriculture Yearbook for 1903 (E. S. R., 16, pp. 163, 166).

Forest conditions in the Little Belt Mountains Forest Reserve, J. B. Leiberg (*U. S. Geol. Survey Professional Paper No. 30, pp. 75, map 1, dgm. 1*).—The location and extent of the Little Belt Mountains Forest Reserve are described. This reserve is situated in southern Montana and embraces 501,120 acres of forested, wooded, and nontimbered lands. A comparatively large area of this tract has been badly burned, more than one-fifth of the total area being so reported.

The topography of the region is described, and the timber species are mostly the lodgepole pine, red fir, and Engelmann spruce, these 3 species furnishing more than 90 per cent of the forest trees. Notes are given on the distribution, age, and rate of growth of the trees, and figures presented which show the volume of mill timber in the reserve to be approximately 250,000,000 ft. B. M., while there is 411,810,000 cu. ft. additional of pole and fuel timber.

Forest conditions in the Lincoln Forest Reserve, F. G. Plummer and M. G. Gowsell (*U. S. Geol. Survey Professional Paper No. 33, pp. 47, pls. 9, map 1, dgms. 2*).—A description is given showing the location and boundaries of the Lincoln Forest Reserve in New Mexico, after which its topography is discussed and the distribution of timber and forest zones described. The principal species are: yellow pine, which furnishes about 61 per cent of the entire forest stand, followed by red fir, white fir, Engelmann spruce, and Mexican white pine. Notes are also given on a number of species of deciduous trees. Statements are given regarding the agricultural and grazing lands embraced within the reserve, and detailed descriptions of the different townships.

Forestry in California (*Forestry and Irrig., 11 (1905), No. 2, pp. 84, 85*).—A description is given of the extent of the forest areas of California, about one-third of the entire wooded area being now embraced in the Federal forest reserves. For the remaining forest area, amounting to some 20,000,000 acres, the State has, through cooperation with the Bureau of Forestry of this Department, worked out a system of forest management, which is briefly described.

Studies have been made of the different types of timberland, and attempts are being made to secure protection from fire. The results of some of the studies are briefly given.

Investigations with chaparral have already shown that it encroaches upon and spreads over the open country in California and makes a satisfactory watershed cover wherever it occurs. Its composition varies with the elevation, previous damage by fire, etc.

The natural reproduction of forest trees has been investigated and the value of such studies is pointed out.

Practicability of forest planting in California, E. A. Sterling (*Water and Forest, 5 (1905), No. 1, pp. 1–3, figs. 2*).—The necessity of timber planting for the protection of irrigation interests as well as for the production of a future timber supply is pointed out. Forest planting is recommended on barren or brush-covered areas which have never supported a forest growth as well as over those areas which

have been lumbered or denuded by fire. A third type of deforested areas which should be protected is that along the margin of timber belts where excessive grazing, brush, fire, or other agents have prevented the natural reforestation of the species. The tendency of the California forests to reproduce themselves is said to be remarkable, and in many cases fire protection alone, at least on areas recently lumbered, will insure a good growth of young forest trees.

Timber cutting in Minnesota (*Forestry and Irrig., 11 (1905), No. 2, pp. 92–94, figs. 2*).—Under the law providing for the Minnesota National Forest Reserve 95 per cent of the pine timber was to be cut under regulations approved by the Bureau of Forestry. Of an area of 225,000 acres, 105,000 have already been selected by the Government for cutting, and the operations already carried on are described.

One of the important results of the previous season's work is said to be the practical demonstration that it is most effective and economical to pile and burn the brush and débris as fast as the logging proceeds. When the burning can not be immediately done the brush should be kept compactly piled and burned at a time when there is no danger of the fire getting beyond control.

The forestry problem of Michigan, J. H. Bissell (*Rpt. Michigan Acad. Sci., 6 (1904), pp. 40–46*).—A description is given of the forestry operations in Michigan, the extent of the lumbering industry being shown. It is claimed that the value of pine and hard-wood lumber cut in the State amounted to \$2,649,175,000. In addition to this enormous amount, over \$859,000,000 worth of pine and hard wood is estimated to have been destroyed by fire and other agents.

The statistics show that a large portion of the State is unsettled and unimproved and is best adapted to the growth of timber. In order to secure the reforesting of the lands the author recommends the repeal of all existing land laws, the acquirement by the State of all pine stump lands, the enactment of new land laws permitting no sale of public lands except to actual homesteaders, and the reclamation of State lands by replanting and thoroughly protecting the growing forests. In addition the author suggests a policy of taxation which would encourage private owners to retain and improve forest holdings.

Forestry plantations in Michigan, E. E. Bogue (*Rpt. Michigan Acad. Sci., 6 (1904), pp. 51–53*).—The author describes at some length 21 plantations located in 18 counties of the State. These include not only the plantations which have been artificially made, but also those which are being managed with a view to securing a future crop.

The largest of the plantations described covers 30 acres, and is devoted to Norway and Douglas spruce and white, Norway, and Scotch pine, about 32,000 trees being planted on this area. The other plantations are briefly described, and an account is given of plantings made on the campus of the agricultural college at Lansing in 1875. These plantings included a large range of species, and at the present time there are said to be about 1,200 living trees, the largest and best of which are chestnut, locust, European larch, white pine, white oak, and basswood.

The plans of the forestry department of the college for future planting are briefly outlined.

The treatment and the economic possibilities of the farm woodlot of southern Michigan, C. A. Davis (*Rpt. Michigan Acad. Sci., 6 (1904), pp. 54–64*).—The author describes the extent of farm woodlots in Michigan, and from his observations in various parts of the State is led to the conclusion that in general the woodlots are carrying only about half the number of trees to the acre that they should contain. The value of various trees for planting is pointed out, and notes are given on the formation of woodlots in different kinds of soil. There are said to be in many portions of the State considerable areas of land which produce but a small revenue, and these the author urges should be planted to timber.

Transvaal forest report, D. E. HUTCHINS (*Pretoria: Govt. Printing and Stationery Off., 1904, pp. 136, figs. 20*).—The author describes the various timber regions selected for plantation sites, after which notes are given on the indigenous flora of the Transvaal region, the forest areas are defined, and the quality and capabilities of forest production are shown.

The author suggests the extension to the Transvaal of the forest laws of Cape Colony, after which notes are given on the meteorological conditions of the region, forest organization, private and municipal tree planting, etc. Annotated lists are given of a large number of species of trees that are believed to be suited for timber production in the Transvaal, together with notes on tree planting, supplies of timber, etc.

The government forest plantation, C. E. LEGAT (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 255–257*).—Notes are given on the government forest plantation of about 500 acres, situated on the Government Farm at Gemsbokfontein, one-fifth of which is devoted to various coniferous trees, principally *Pinus halepensis, P. pinaster, P. canariensis*, and *Cupressus lusitanica*. The remainder of the plantation will be devoted to Eucalyptus species, the most of which are to be planted with a view to the production of railway ties.

In addition to the description of the plantation, a brief report is given on the Rhodesian teak, in which the weight and strength of the wood are given and figures presented showing the ratio of strength of this wood to a number of timbers in common use.

Extra-tropical forestry, D. E. HUTCHINS (*Agr. Jour. Cape Good Hope, 26 (1905), No. 2, pp. 171–185, figs. 2*).—In continuation of notes on timber and other forest trees for cultivation in South Africa, the author describes plantations which have been made of hardwoods for the production of railway timbers.

The failure of metal sleepers to give satisfactory results has, according to the author, led to the importation of large quantities of wooden ties, mostly from Australia. These he estimates could be readily produced in parts of South Africa, experiments having shown that sample plats of *Eucalyptus saligna* produced an average yield of over 527 cu. ft. per acre annually for the past 18 years. This rate of production is said to be far in excess of the calculated production which is necessary for the economic planting of trees.

The growth of timber trees in Egypt, G. BONAPARTE (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 5, pp. 169–177*).—But little attention has been given the subject of the growth of timber trees on account of the comparatively limited areas which could be advantageously turned to this use. The author believes, however, that in some regions it would be possible to economically produce trees for various purposes, and he describes a number of the best-known and most important trees for culture in Egypt.

The fixation of sand dunes and oasis protection in Tunis, L. TELLIER (*Bul. Agr. Algérie et Tunisie, 11 (1905), No. 1, pp. 9–15*).—An account is given of attempts made by the Forest Service of Tunis in holding in check the sand dunes about some of the oases in southern Tunis.

The methods that have been successfully pursued in Gascony have been applied, but the conditions were complicated somewhat by the fact that the sands in Tunis are more shifting and the surface rock is rapidly disintegrating, forming new sources of material. The work of fixing the dunes was begun in 1888 and the usual methods of sand binding were resorted to. Grasses were planted, especial use being made of *Aristida pungens*, and various kinds of brushwood were employed. Where the dunes were temporarily checked it was found possible to secure a good growth of a number of shrubs, especially *Rœtama rœtam* and *Tamarix africana*. Attempts have been made to introduce various exotic species, such as acacias, Parkinsonia, etc., with varying success.

The necessity of trees for the region is pointed out, and the results so far obtained with *Parkinsonia aculeata* and *Tamarix articulata* indicate their value for such planting. Thus far about 900 acres of dunes have been bound together so as to prevent further encroachment on oases embracing about 1,760 acres. The cost has been about $8,500.

The reforesting of cultivated lands, WERNER DE MÉRODE ET AL. (*Jour. Soc. Cent. Agr. Belg., 52 (1905), No. 3, pp. 99–105*).—A report is given of an investigation by a special commission that was appointed to examine into the forestry conditions of Belgium and especially the means to be adopted to secure the reforesting of areas not suited to general agriculture.

The results of the application of previous laws and subsidies are shown, and the committee offers a number of suggestions for the still further extension of reforested areas. These suggestions embrace an increase in the number of trained foresters, subsidies, remission of taxes, better care of communal forests and means for their extension, organization of forest conferences, establishment of government nurseries where trees for planting can be secured in large numbers at low cost, etc.

Hybrid characters as expressed in the genus Catalpa, P. D. PENHALLOW (*Abs. in Science, n. ser., 21 (1905), No. 535, pp. 505, 506*).—According to the author a new hybrid catalpa was described by Professor Sargent in 1889 from Carthage, Mo., which was attributed by him to a cross between *Catalpa kæmpferi* and *C. bignonioides*. This opinion was based largely on the fact that these two species flowered simultaneously, while the owner of the nursery believed that the hybrid was between *C. speciosa* and *C. bignonioides*.

The author has made an examination of typical material taken from the mature stems of the hybrid and from each of the possible parents, and has recognized hybrid characters in the vascular structure, which tend to establish the origin of this new horticultural form. He claims that the hybrid characters show that it is a product of a cross between *C. kæmpferi* and *C. bignonioides*, as previously believed by Sargent. The manifestation of the different characters is given at some length.

The variability of Eucalyptus under cultivation, J. H. MAIDEN (*Proc. Linn. Soc. New South Wales, 28 (1903), pt. 3, pp. 887–903; abs. in Bot. Centbl., 98 (1905), No. 1, p. 5*).—Attention is called to the extreme variation in species of Eucalyptus when grown under conditions of cultivation, and particularly the variations occurring outside of Australia. In the paper reported a large number of cultivated variations are described, many of which have been previously considered as independent species. The author has brought these together, and shows that they can not be considered as true species, but are merely the cultivated specimens of well-known forms.

Wattle bark (*Queensland Agr. Jour., 15 (1904), No. 5, pp. 730–734*).—A description is given of the growing of wattle barks, or species of acacia, in New Zealand, Natal, and elsewhere for the production of tan bark.

In New Zealand, where the black wattle (*Acacia decurrens*) is the principal species planted, more than 4,500 acres are devoted to artificial plantations. The cost of planting and the net income are given, from which it appears that a net profit of about $80 per acre can be expected. This is exclusive of taxes, interest on investment, and possible revenue from the wood.

In the Natal plantations described, an estimate is made for the planting of 100 acres of black wattles, their care for 7 years, and the marketing of the bark and wood, which is used for fuel. The net profit on investment is said to be about $50,000. This profit is based on a price of about $29 a ton for the bark and a valuation of 50 cents each for the trees as fuel.

Notes on bastard logwood, B. C. GRUENBERG and W. J. GIES (*Bul. Torrey Bot. Club, 31 (1904), No. 7, pp. 367–377, figs. 2; reprinted in West Indian Bul., 5 (1904), No. 3, pp. 249–258*).—The authors have made a study of the different forms of logwood to determine some of the differences between the commercial article and the

form commonly known as bastard logwood. In a previous publication (E. S. R., 14, p. 882) the opinion is expressed that the bastard logwood is a distinct variety or subspecies of *Hæmatoxylon campechianum.*

The authors believe that the bastard logwood is simply a form of the usual species with different physiological properties. The most significant fact shown by their analyses of the heartwood of typical specimens of logwood was the low carbon content of the poorer wood, which may be due to the lower pigment content. No morphological differences were discernible in young seedlings of red logwood and bastard logwood, and their experiments seem to indicate that the metabolism of the seedlings was essentially alike in both varieties. The chemical differences noted were slight and are probably due to differences in the amount of pigment deposited.

Extracts made with various solvents gave solutions of different colors and intensities, indicating the presence of at least two pigments in varying proportions, or a pigment radical in different combinations. Aqueous extracts of the two varieties of logwood gave different reactions to acids, alkalis, and other reagents. The differences noted are parallel to those observed between a fresh aqueous solution of commercial logwood extract and the same solution after it had become discolored on long standing.

The production of coniferous timber, R. ANDERSON (*Trans. English Arbor. Soc., 6 (1904–5), pt. 1, pp. 69–72*).—Notes are given on the production of *Pinus sylvestris* in Great Britain, comparisons being drawn between the timber grown in that country and the imported product. A description is also given of the Hauptsmoor forest in Bavaria, in which Scotch pine is extensively cultivated.

Coniferous trees for parks and gardens, E. LEPLAE (*Rev. Gén. Agron.* [*Louvain*], *13 (1904), No. 11–12, pp. 449–458*).—Descriptions are given of a number of coniferous trees, most of which are exotics, which are considered of sufficient promise to warrant their extensive planting in parks and gardens in Belgium or similar regions.

The formation and treatment from planting to maturity of a crop of larch, R. J. WYLAM (*Trans. English Arbor. Soc., 6 (1904–5), pt. 1, pp. 57–68*).—Directions are given for the formation of nurseries, nursery cultivation of the larch, its planting, and subsequent treatment in the forest to produce a crop of timber under conditions of economical management.

The author states that larch when about 70 years old is in its most valuable and solid state as timber, and if the crop is to be marketed as timber the trees should be cut at about this age. Notes are also given on the management of a larch plantation for securing a supply of hop poles.

Notes on the Japanese larch, H. BEEVOR and W. SOMERVILLE (*Trans. English Arbor. Soc., 6 (1904–5), pt. 1, pp. 85–88*).—The growth of the Japanese larch, as shown by specimens planted in a number of places in Scotland and elsewhere, is indicated, and the resistance of the trees to the larch canker is pointed out. While it is possible that under normal conditions this species may suffer from the larch disease, it is believed to be considerably more resistant than the species commonly cultivated.

Influence of tree planting upon the duty of water in irrigation, F. H. KING (*Forestry and Irrig., 11 (1905), No. 2, pp. 61–71, figs. 4*).—A report is made upon the influence of wind-breaks upon vegetation, much of the information being drawn from Wisconsin Station Bulletin 42 (E. S. R., 6, p. 622). In addition, a report is given of the evaporation of water as influenced by wind-breaks and various cover crops.

In conclusion the author states that it is probable that the losses of water by evaporation from fields in irrigated districts of the Western United States between April 1 and October 31 ranges from 1.57 in. to 50 in., and the maximum conservation of soil moisture through wind-breaks is about 40 per cent, so that there would be a protection amounting to from 0.63 in. to 20 in. due to the wind-breaks.

The preparation and management of hedges, T. CONWAY (*Trans. English Arbor. Soc., 6 (1904–5), pt. 1, pp. 46–56*).—The author describes the methods of preparation of the ground, mode of planting, and proper treatment of hedges of hawthorn, beech, hornbeam, holly, privet, myrtle, etc.

Strength of timber treated with preservatives (*Forestry and Irrig., 11 (1905), No. 1, pp. 34–36*).—A description is given of the plan pursued by the Bureau of Forestry in treating and testing timber at the St. Louis timber testing station. Experiments have been carried on with both green and seasoned loblolly pine to determine the effect of the preliminary processes, such as steaming, on the mechanical properties of the timber, and also to determine the effect of preservatives on the strength of the timber. The preservative fluids investigated included only creosote and zinc chlorid.

The work is not sufficiently advanced to allow the drawing of final conclusions, but from the preliminary results it was found that the steaming process weakened the resistance of the wood fiber to both static and impact loadings, and the diminution was nearly in direct proportion to the length of time that the steam pressure was applied. The diminution in strength was found to be 25 per cent after undergoing a pressure of 20 lbs. for 10 hours when applied to green loblolly pine, and 10 per cent when applied for 4 hours.

From these preliminary results it is recommended that where possible the use of preliminary steaming operations for preserving wood should be dispensed with.

The preliminary experiments with zinc chlorid do not seem to indicate that this preservative reduces the strength of the timber beyond the effect of the steaming process. It is possible that the crystallization of the zinc chlorid will ultimately weaken the wood fiber. The effect of creosote appears to be about the same as that of an equal amount of water; that is, the strength of creosoted timber is about equal to that of the green timber.

SEEDS—WEEDS.

A new method of treating seed, E. BREAL and E. GIUSTINIANI (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 14, pp. 554–556*).—The investigations of the authors have shown that vetch seed placed for 20 hours on moist plaster disks increased their weight by 55 per cent.

When these seed were planted in soil containing 20 per cent moisture they produced in one month six times as much dry matter as a similar lot of unsoaked seed. As most cultivated soils contain less than 20 per cent of water, the advantage of preliminary soaking of the seed is apparent. However, the preliminary treatment of the seed would make it more susceptible to attacks of fungi of various kinds, and on this account the use of copper sulphate is resorted to to protect the seed. After soaking the seed in copper sulphate they are usually covered with lime to prevent further corrosive action.

The authors have for 2 years experimented on treating various kinds of seed by placing them in a solution containing from 1 to 5 parts per 1,000 of copper sulphate in which is stirred while boiling 2 to 3 per cent starch. After cooling the mixture, 4 to 5 times its weight of seed is placed in it, thoroughly mixed, and allowed to remain for 20 hours, after which the seed are dusted with lime and spread to dry. In this way every grain is covered by a mixture of starch, lime, and copper.

The effect of the treatment on the production of a number of plants has been tested in pot experiments, with the following results.

Relative yield in dry weight from treated and untreated seed.

Kind of seed.	Duration of experiment.	Yield of untreated seed.	Yield of treated seed.	Kind of seed.	Duration of experiment.	Yield of untreated seed.	Yield of treated seed.
	Days.				*Days.*		
Maize	45	100	120	Wheat	36	100	115
Do	56	100	146	Do	38	100	122
Do	65	100	160	Barley	36	100	120
Do	57	100	126	Do	19	100	140
Do	34	100	124	Oats	35	100	110
Do	49	100	162	Do	20	100	120
Wheat	32	100	147	White lupine	33	100	119
Do	35	100	116	Buckwheat	30	100	116

Similar experiments have been conducted with maize in the field, in which equal quantities of seed were planted at fixed distances, cultivated in the same manner, and after 100 days the product harvested. In every case the treated seed gave a larger yield of total dry matter as well as of grain, and the ears of corn were more matured. The increase in the 5 plats varied from 107 to 137 for the entire harvest and from 112 to 148 for the yield of grain as compared with 100 for the check plat.

The influence of naphthalin on the germination of cereals, W. Busse (*Abs. in Ztschr. Pflanzenkrank., 14 (1904), No. 4, pp. 219, 220*).—On account of the rather common use of naphthalin in the Tropics to protect seeds of all kinds against insect injuries, the author investigated the effect of such treatment on the germination of a number of common grains. Specimens of grain were subjected to from 1 to 3 per cent naphthalin for indefinite periods of time, although experience has shown that 1 per cent is sufficient for all protective purposes.

The 1 per cent naphthalin was practically without effect on the germination of pearl millet and sorghum seed after exposure for a year. All the germinations of maize reported were very low, and no conclusion is drawn from the experiment with that cereal. Rye was not injured by 6 months' exposure to naphthalin, and barley gave higher germinations for treated than for untreated seed. A lot of German maize was subjected to naphthalin without any conspicuous influence being observed.

Is germination possible in the absence of air? T. Takahashi (*Bul. Col. Agr. Tokyo Imp. Univ., 6 (1905), No. 4, pp. 439–442*).—The author in previous experiments has shown that the germination of peas could not take place in the absence of air, although the intramolecular respiration was carried on continuously for a number of weeks. In the present paper he reports experiments with rice, in which it is shown that the seed can germinate in water without the presence of any sugar and in the entire absence of air, the molecular respiration furnishing the energy necessary for the germination.

The germination of mistletoes, W. A. Cannon (*Bul. Torrey Bot. Club, 31 (1904), No. 8, pp. 435–443, figs. 6*).—The author reports a study of the germination of *Phoradendron villosum* and *P. californicum*, the common species of mistletoe in Arizona and southern California. According to his observations, there is nothing to indicate the truth of the claim frequently made that mistletoe seeds will not germinate without having first passed through the alimentary tract of birds. The exact condition required for germination seems to be the maturity of the seeds. A large amount of heat is not necessary for their germination, nor is germination dependent upon rains.

The author describes the method by which the seed attaches itself to a host plant and the penetration into the cortex by the seedling. The cotyledons apparently never emerge from the seed until a firm foothold has been secured by the roots; and this frequently takes several months from the time germination begins. The methods of securing entrance into the host plants of the different species are somewhat different, but in general they agree in that the solvents secreted by the haustoria of the parasite are not able to dissolve suberized cell walls, and for this reason the points

of admission to the mistletoe are through the lenticels or places where the parasite penetrates through cellulose cell walls. This conclusion is based on anatomical evidence alone, and is to be the subject of further experimental investigation.

Annual report of the Danish seed control station, 1903–4, K. Dorph-Petersen (*Aarsber. Dansk Frökontrol, 33 (1903–4), pp. 55*).—A report is given of the activity of the seed control station of Denmark for the year ended June 30, 1904, in which the usual data relating to purity, germination, etc., of seeds are given.

The twenty-seventh annual report of the Swiss seed control station at Zurich, F. G. Stebler et al. (*Landw. Jahrb. Schweiz, 18 (1904), No. 12, pp. 589–643, figs. 3*).—A detailed report is given of the activity of the federal seed control station at Zurich for the year ended June 30, 1904. During this time 10,166 samples of seed were tested, and the details of the tests are given. Investigations are reported briefly on studies of a number of different kinds of seed, particularly those of leguminous fodder plants, grass mixtures, etc.

Weed pests (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 12, pp. 490–492*).—Notes are given on a number of weeds that are more or less troublesome throughout the Tropics, and attention is called to the fact that many of these species, which seem to grow with great rapidity and threaten to become a general nuisance after becoming extremely abundant, die away almost as rapidly, and later frequently become very scarce. This is said to be true of lantana and a number of other tropical species.

Some injurious weeds, J. Burtt-Davy (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 291–299, pls. 5*).—Descriptions are given of a number of species of injurious weeds, their distribution throughout southern Africa and elsewhere is indicated, and, so far as known, methods of eradication are described. Many of the species enumerated are common to this country, and the suggestions for eradication are in a number of cases based upon investigations carried on at the experiment stations and elsewhere.

On the eradication of weeds by spraying with iron sulphate solution, E. Haglund and H. von Feilitzen (*Svensk Mosskult. Tidskr., 18 (1904), No. 6, pp. 413–420*).—Preliminary experiments on moor soils showed that the spraying method furnishes an effective means of checking, if not killing, many of the weeds growing on such soils.—F. W. WOLL.

DISEASES OF PLANTS.

Department of botany, L. F. Henderson (*Idaho Sta. Rpt. 1904, pp. 27–32*).—A study was made during the season of the apple-twig blight and of the yellows or blight of tomatoes. Some fertilizer experiments to control the latter are recorded in some detail.

Tomato yellows, as the author prefers to call this disease, "makes itself known by a gradual yellowing of the whole plant, leaves and fruit as well as stem, and a refusal of the plant to produce more than half-grown fruit, which never ripens, though the plant retains its succulent nature till late into the season." This disease is the cause of nearly all of the tomato failures found in the State, especially in the Lewiston district in southern Idaho.

Experiments by the author indicate that "plants set in new land in southern Idaho will be largely overcome with blight. Those set in well-drained, well-watered, and manured soil will not blight so badly." It was found that where the root system was not disturbed plants were more resistant to the disease than otherwise. All varieties appeared to be equally susceptible to the disease.

Diseases of plants cultivated in the Tropics, G. Delacroix (*Agr. Prat. Pays Chauds, 5 (1905), No. 23, pp. 154–167, figs. 3*).—In continuation of the previous paper (E. S. R., 16, p. 676) the author concludes his observations relating to the healing of

wounds of various kinds, and in the present paper he takes up the subject of gum formation in acacias and other leguminous plants.

Lessons from the grain-rust epidemic of 1904, M. A. CARLETON (*U. S. Dept. Agr., Farmers' Bul. 219, pp. 24, figs. 6*).—The author describes the nature of rusts attacking wheat and oats, and gives reasons for the unusual prevalence of rust in 1904. This is attributed to the fact that there was an unusual amount of moisture and a delayed period of ripening of the grain.

The amount of injury due to rusts is reported as having been very great, and as means for preventing its repetition the author suggests the investigation of resistant or early maturing varieties. Attention is called to the resistance of some varieties of durum wheats, and while they are more resistant than the common varieties there is as great variation among the durum wheats as among the common varieties.

The importance of growing hard winter wheats where practicable is pointed out as a means of escaping serious injury by rusts, and seed selection with reference to rust resistance is strongly urged. The author comments upon the partial resistance of different varieties of oats and other cereals.

Rapid method of removing smut from seed oats, J. C. ARTHUR (*Indiana Sta. Bul. 103, pp. 257–264*).—A description is given of a method of treatment of seed oats on a large scale, which was tested under the author's supervision in an elevator in Benton County, Ind.

All the grain was handled by machinery at the rate of about 500 bu. per hour, and it was subjected to formaldehyde at a cost of about one-third of a cent per bushel. To carry out the treatment a vertical drop or chute about 3 ft. square and 40 to 50 ft. high was prepared, and on the inside were placed shelves or deflectors sloping downward, alternating on two opposite sides from top to bottom. As the grain dropped from the top it was thrown from side to side by the deflectors and thus thoroughly mixed.

By means of a small steam pump the formaldehyde was thrown against the falling grain near the top of the drop in a fine spray. By the time the grain reached the bottom it had been thoroughly moistened with perfect uniformity. The grain is allowed to remain in the bin for at least 2 hours, after which it can be sown or may be run through the drop a second time and dried with a blast of cold air.

Tests were made of treated seed in which the efficiency of this method was demonstrated. It is said that a number of grain elevators in Indiana have provided machinery for this work and will treat seed oats without any expense to the purchaser.

Treatment of oats for smut, A. N. HUME (*Illinois Sta. Circ. 89, pp. 3*).—The author describes the formalin, hot water, and other treatments for the prevention of oat smut, and from practical trials recommends the treatment with formalin or with hot water as the most practical.

Potato rot, G. BARBUT (*Prog. Agr. et Vit. (Ed. L'Est), 26 (1905), No. 9, pp. 264–269, pl. 1*).—A description is given of the potato rot, due to *Phytophthora infestans*, and attention called to the different power of resistance possessed by different varieties of potatoes.

Brief accounts are given of spraying experiments to control the disease, and the author recommends thorough spraying with Bordeaux mixture, to be followed by a second or third application if the temperature and moisture are suited to the rapid development of the fungus. Tomatoes being subject to attacks of the same disease, the author recommends a similar treatment for their protection.

Rotting of potatoes (*Jour. Bd. Agr. [London], 11 (1905), No. 11, pp. 676–678*).—Notes are given on the destruction of stored potatoes due to the action of the fungi *Phytophthora infestans* and winter rot (*Nectria solani*). This latter fungus is said to be quite common in stored potatoes, and in the earlier stages it produces a softening and swelling of the tubers, which are later attacked by bacteria, showing forms of wet rot.

Experiments have been carried on to test the effects of dusting with quicklime and slaked lime for preventing winter rot. Of the two kinds of lime used, finely powdered quicklime was preferable. The lime in either form does not prevent the rotting of tubers already affected, but will protect sound ones against the spread of the disease. Both forms of lime seem to hasten the sprouting of the tubers in the spring, those treated with quicklime sprouting a fortnight earlier than the untreated ones, while those treated with slaked lime sprouted 3 weeks in advance of the others.

Potato experiments in 1904, C. D. Woods (*Maine Sta. Bul. 112, pp. 1–12*).—An account is given of experiments conducted to test the effect of storage on the rotting of potatoes and experiments with dry Bordeaux mixture and soluble Bordeaux mixture as a preventive of potato blight.

From the experiments on the keeping of potatoes it is concluded that the infection with the fungus takes place chiefly if not entirely in the field before digging, and is usually the result of diseased vines. In the majority of cases the infection is indirectly through the soil, and not directly through the vine. Spores produced from rotten potatoes left in the land in the preceding year or introduced in manure will affect a subsequent crop. There appears to be much less liability of loss from rotting in the cellar in the case of late-dug potatoes.

In the experiments with fungicides for the prevention of potato rot, dry Bordeaux, which was formerly marketed under the name of Fungiroid, was tested. The plants were treated with the dry powder, and comparisons made with similar treatments with regular Bordeaux showed that the dry Bordeaux mixture applied to dry vines is not effective in preventing blight and rot. It will be tested for another season on damp vines to see if it is of value as a fungicide in garden culture of potatoes.

The soluble Bordeaux mixture tested was made from a formula furnished by the Wisconsin Experiment Station, and consists of a copper sulphate solution, in which 1 lb. of copper sulphate is dissolved in 2 gal. of cold water, and a solution of sucrate of lime, which is formed by slaking 10 lbs. of fresh lime in 30 lbs. of water, straining, and adding to the solution 25 lbs. of granulated sugar to 50 lbs. of water. These 2 solutions are mixed in equal parts and 3 parts of water added. Prepared in this manner the solution contains about the same amount of copper hydrate as the ordinary Bordeaux mixture.

The soluble Bordeaux mixture was used in spraying potatoes in comparison with ordinary Bordeaux mixture of equal strength, and it was found to cost more, both in material and labor, and the yields were smaller and the quality inferior from the plats sprayed with soluble Bordeaux mixture than ordinary Bordeaux mixture. On this account it is not to be further recommended.

A bacterial disease of lettuce, P. Voglino (*Ann. R. Acad. Agr. Torino, 46 (1903); abs. in Ztschr. Pflanzenkrank., 14 (1904), No. 2, p. 96*).—The occurrence of a bacterial disease of lettuce due to *Bacillus lactucæ* is reported. Considerable loss is said to have been caused by the disease, which was very conspicuous throughout the year except during May, when it was somewhat less abundant.

Rich soils and moist situations seem to favor the occurrence of the disease. It is characterized by a marked softening of the leaves and stems, and in severe cases by the browning and decay of the tissues involved. An examination of the stems showed the fibrovascular bundles and laticiferous tissues filled with bacteria, which were isolated and described. Pure cultures of the organisms on gelatin and lettuce juice formed round, ivory-white colonies which gradually changed to rose colored. Inoculations from the pure cultures of the organisms produced the disease with all its usual characteristics in about 14 days. Plants grown in soils unusually rich in nitrogen were said to suffer more from the disease than those not so situated.

A new apple disease, W. Paddock (*Colorado Sta. Rpt. 1904, p. 99*).—The author reports the occurrence of an apple disease, which is believed to be new to science, that has been observed in several parts of the State. The fungus (*Alternaria* sp.)

causing the disease has been studied, and inoculation experiments have proved it to be the cause of the apple decay. The disease has not been at all serious, and should it threaten to become destructive, Bordeaux mixture properly applied, it is believed would be an efficient remedy.

Trichothecium roseum as a cause of bitter rot, K. S. IVANOV (*Ztschr. Pflanzenkrank., 14 (1904), No. 1, pp. 36–40, fig. 1*).—The bitter rot of apples and other fruits due to the fungi *Cephalothecium roseum* and *Trichothecium roseum* is described and attention called to the fact of two morphologically nearly related fungi causing similar diseases. The Cephalothecium occurs on the fruit of the apple and probably on the pear, while the Trichothecium is reported as attacking the apple, pear, plum, filbert, and nuts of *Pinus cembra*. The infrequent occurrence of Trichothecium is attributed to the exceedingly long period of development of the fungus.

Peach rosette, P. EVANS (*Missouri Fruit Sta. Bul. 11, pp. 11, figs. 3*).—Peach rosette is described, with notes on its distribution and economic importance in Missouri and other western States. The disease was first noticed on the station grounds in 1901 and since that time has spread extensively, causing serious losses. Usually the disease is rapidly fatal, but some instances are known where trees survive 2 years.

A very similar disease was observed on plum trees, and although cross inoculations have been made, it is not yet certain whether the 2 diseases are identical.

The only treatment recommended by the author for rosette is the removal and destruction of all affected trees.

Diseases of orange trees, R. A. DAVIS (*Transvaal Agr. Jour., 3 (1905), No. 10, pp. 340–342*).—Brief notes are given on a number of orange diseases. Among them are described the collar rot, also known as gummosis and root rot, the mottled leaf, which is said to be a form of partial chlorosis, an apparently new leaf-spot disease, and die back.

The mottled leaf and leaf-spot diseases are both apparently of recent occurrence, and the former may be recognized by the tendency on the part of the leaves to turn yellow without any evidence of fungus growth. The application of a general fertilizer by improving the health of the tree has generally proved beneficial. The leaf-spot disease is apparently of fungus origin and is easily distinguished by the occurrence of brownish spots on the under side of the leaves.

As yet no fungus has been separated as the definite cause of the disease, and the author reports that a single spraying with Bordeaux mixture will usually prevent further spread of the disease.

Spraying fruit trees and bushes, W. E. BEAR (*Jour. Bd. Agr. [London], 11 (1905), No. 11, pp. 641–650*).—Directions are given for the preparation of a number of the more common fungicides and insecticides, and notes on their application in preventing fungus and insect injuries of apples, plums, pears, cherries, gooseberries, and currants.

Bacterial gummosis of grapes, G. CHAPPAZ (*Prog. Agr. et Vit. (Ed. L'Est), 26 (1905), No. 9, pp. 269–272*).—Notes are given on the occurrence of the bacterial gummosis of grapes in Lower Burgundy and elsewhere.

The characteristics of the disease are described, and for its prevention the author recommends heavy applications of superphosphate fertilizers. At the same time the diseased portions of the vine should be cut out and destroyed, and the vines washed with a solution containing 25 to 30 per cent of iron sulphate.

Resistance of the Lenoir grape to the California vine disease, N. B. PIERCE (*Pacific Rural Press, 69 (1905), No. 5, p. 78*).—The author reports the results of his investigations on the use of the Lenoir variety of grapes for the control of the California vine disease.

The experiments with grafted stock have been in progress in a badly affected district for more than 8 years, during which time more than 400 acres of vines have been grafted. From this work the following conclusions are drawn: The Lenoir

vine, grown upon its own roots, is practically resistant to the California vine disease and has been known to thrive and bear heavily for 15 years in the midst of thousands of acres of dead and dying vineyards.

"The Lenoir vine, as a top graft, has been known to save tender Muscat roots for several years after all Muscats upon their own roots had been killed by the disease throughout the surrounding region. The Lenoir vine, as a root upon which to graft varieties of grapes very subject to this disease, and which are fully exposed to its action, has saved tens of thousands of such tender tops in a vigorous and normal condition for nearly or quite 5 years, or to the present date in the midst of dying vineyards, and hundreds of acres of younger vines on the same root are perfectly thrifty and normal under like conditions. New varieties of grapes which have received Lenoir blood through hybridizing have shown resistance to the same disease."

The author believes that the vine disease in the Santa Clara Valley is identical with the California vine disease.

Brunissure and its physiological significance, V. DUCOMET (*Assoc. Franc. Avanc. Sci., 32 (1904), pp. 697–707; abs. in Bot. Centbl., 98 (1905), No. 4, pp. 96, 97*).—Brunissure is said to be not a specific disease but a physiological accident.

The so-called *Plasmodiophora vitis* and *Pseudocommis vitis* are not living organisms, as has been claimed, but are peculiar manifestations of the cell contents due to the action of various physical agents. The characteristics which have been described for these alleged fungi are said to be due to the slow exosmosis of water from the cytoplasm and other cell contents, permitting them to assume new forms and modified structures.

Among the causes attributed for brunissure the author mentions overbearing, which has already been shown by Ravaz (E. S. R., 16, p. 272) to be one of the principal causes of the disease. In this case a disturbance in the equilibrium of the nutrition of the plant results in the diseased appearance.

Notes on witches' broom of cypress, F. MUTH (*Naturw. Ztschr. Land- u. Forstw., 2 (1904), pp. 439–444, figs. 4; abs. in Bot. Centbl., 98 (1905), No. 5, p. 122*).—A form of witches' broom on *Taxodium distichum* in Baden has been investigated, and the author describes at some length the characteristic outgrowth, and he also gives the results of studies on the anatomical changes observed in the twigs of the host. The malformations are believed to be due to some species of Nectria, although the fruiting bodies of the fungus have not been observed.

Notes on the fungus occurring in the root tubercles of alders, C. G. BJÖRKENHEIM (*Ztschr. Pflanzenkrank., 14 (1904), No. 3, pp. 129–133, pl. 1*).—A study is given of the hyphal fungi found in the swellings of the roots of *Alnus incana*. The fungus is described at length.

A Botrytis disease of tulips, H. KLEBAHN (*Ztschr. Pflanzenkrank., 14 (1904), No. 1, pp. 18–36, pl. 1*).—A disease of tulips which has been under observation for several years is described. It seems to have been noticed first in Hamburg, and its cause has been previously referred to *Botrytis parasitica* (E. S. R., 15, p. 273).

The author of the present paper has made an extensive study of the disease and its cause, which is thought possibly to be due to a different species of Botrytis than that mentioned above. Inoculation experiments were made with the fungus on hyacinth, narcissus, crocus, and other bulbs, and the results are described at length. Studies were made of the fungus, pure cultures of it being grown, which were compared with a number of species of Botrytis in an endeavor to determine the identity of the tulip disease fungus.

The diseased bulbs may be readily recognized by the occurrence of sclerotia on the scales, and in planting all such should be rejected. Notes are given for the prevention of the disease, based largely upon the character of the sclerotia and the possibility of their distribution through the soil, on bulbs, implements, etc.

ENTOMOLOGY.

Report of the entomologist (*Colorado Sta. Bul. 94, pp. 85, pls. 3*).—Some of the more important insects of 1903 and an annotated list of Colorado Orthoptera are discussed by C. P. Gillette.

A grain bug (*Pentatoma sayi*) was reported as causing great injury to oats, wheat, and other grain. The insect was also observed on alfalfa, sunflowers, garden vegetables, and other plants. The pest is single brooded and there appears to be considerable advantage in having the grain ripen early. Fall wheat almost entirely escapes injury. Grasshoppers were comparatively few in numbers during the season. Further experiments were made with Australian grasshopper fungus, but no evidence was obtained that this fungus has any effect upon the grasshoppers. The use of Criddle mixture was of little avail, but better results were obtained with poisoned bran.

Economic, biological, and descriptive notes were also given on the army cutworm and other species of cutworms, leaf rollers, beet webworm, gooseberry fruit worm, plant lice, false chinch bug, and western wheat-stem maggot which is described as a new species under the name *Pegomyia cerealis*. A list of the Orthoptera which occur in Colorado is also given with brief notes on their distribution and habits. The total number of species of Orthoptera discussed is 145. These insects are distributed throughout the State from the lowest to the highest altitudes.

L. Bruner presents descriptions of some new species of Colorado Orthoptera. The species described as new belong to a number of genera including Nemobius, Aeoloplus, Hesperotettix, etc.

T. D. A. Cockerell discusses the bees of the genus Nomada found in Colorado. The collection examined by the author contained 29 species, 15 of which are described as new.

Report of the entomologist, C. P. Gillette (*Colorado Sta. Rpt. 1904, pp. 91–93*).—Brief notes are given on the injurious insects of the year. Thorough treatment is said to reduce the injury from the codling moth to about 5 per cent. Notes are also given on potato flea beetle, woolly aphis, apple aphis, black peach aphis, cottony maple scale, rose scale, species of Chermes on pine and spruce, grasshoppers, cutworms, and *Anabrus simplex*.

On some injurious insects of 1904, R. S. MacDougall (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 212–228, figs. 16*).—The black currant-gall mite continues to cause great damage. In controlling this pest it is necessary to dig up and burn affected bushes. The cabbage maggot is least injurious to early sown plants. Cabbages may also be protected by means of tarred paper, the use of kerosene about the plants, or bisulphid of carbon. Economic and biological notes are also given of *Sirex juvencus* injurious to woodwork, *Helophorus rugosus* on turnips, grain and rice weevils, and grain flies in oat fields.

Insects injurious to shade trees and ornamental plants, J. B. Smith (*New Jersey Stas. Bul. 181, pp. 50, pls. 3, figs. 21*).—The disadvantages with which city shade trees have to contend in securing plant food and suitable aeration for the roots are briefly outlined.

The greater portion of the bulletin is occupied with a discussion of the appearance, distribution, natural enemies, and artificial means of repressing plant lice, leaf hoppers, scale insects, borers, leaf-eating caterpillars, and other pests of shade trees. The most important scale insects discussed are cottony maple scale, tulip soft scale, oyster-shell bark-louse, scurfy scale, San José scale, and *Pseudococcus aceris*. Among the leaf-eating insects particular mention is made of white-marked tussock moth, bagworm, fall webworm, elm-leaf beetle, and sawflies.

Brief directions are given regarding the selection of insecticide machinery and preparation of suitable insecticides for use on shade and ornamental trees.

A victorious campaign against the insects, E. L. FULLERTON (*Gard. Mag., 1 (1905), No. 2, pp. 68–71, figs. 11*).—Detailed advice is given regarding the methods of combating the potato beetle, squash bug, cutworms, plant lice, cabbage butterflies, and other insects together with suggestions on the preparation of insecticides.

First report of the Wellcome research laboratories at the Gordon Memorial College, Khartoum, A. BALFOUR (*Khartoum: Department of Education, Sudan Govt., 1904, pp. 84 + III, pls. 5, figs. 60*).—The purposes for which the Wellcome research laboratories of the Gordon Memorial College were established are as follows: To promote technical education, to study tropical diseases of man and animals, to investigate methods of detection of toxic agents, to make chemical and bacteriological tests, and to carry out other related lines of research.

The present report covers the work of the first year and is devoted to a description of the buildings and equipment of the laboratories together with notes on some of the researches thus far carried out. It was found that the most common species of the mosquito in the region of Khartoum is *Culex fatigans*. A number of other species, however, occurred in this locality including those which carry malaria and yellow fever.

Notes are given on the common breeding places of the various species and also on the results of work thus far executed in the control of mosquitoes. The methods adopted include the use of kerosene and drainage as well as disinfection of steamers. In the future, a more systematic course of eradication of the mosquitoes will be adopted. Experiments were made in testing the action of chrysoidin, a yellow anilin color. It was found that a solution of this substance at the rate of 1 to 30,000 in water destroyed mosquito larvæ belonging to the genera Culex and Anopheles. The amount required for practical purposes, however, renders the method too expensive.

A list is given of mosquitoes found along the Nile and its various tributaries. A monographic account of the mosquitoes of Egypt, Sudan, and Abyssinia is presented by F. V. Theobald. A number of biting and noxious insects other than mosquitoes are also noted. Among these mention may be made of tsetse fly and various species of horse flies as well as a plant louse injurious to sorghum. The last-named insect is described by F. V. Theobald as a new species, under the name *Aphis sorghi*. This insect causes great injury to sorghum but is held in check to some extent by a number of lady beetles and a fungus disease. It was found in the study of cyanogenesis that sorghum plants badly infested contained a larger quantity of hydrocyanic acid than did uninfested plants.

The first list of the Orthoptera of New Mexico, S. H. SCUDDER and T. D. A. COCKERELL (*Proc. Davenport Acad. Sci., 9 (1901–1903), pp. 1–60, pls. 4*).—An attempt was made in the present paper to present as full a list as possible of the Orthoptera found in New Mexico with notes on the life zones, distribution of the Orthoptera, food plants, and a discussion of local faunæ.

The corn root-worms, F. H. CHITTENDEN (*U. S. Dept. Agr., Bureau of Entomology Circ. 59, pp. 8, figs. 3*).—The life history, habits, and remedies for the western and southern corn root-worms are discussed. Both of these species are described in detail with notes on their geographical distribution and food plants.

The remedies to be used against the larvæ of *Diabrotica 12-punctata* are largely of a preventive nature. Recourse must be had to improved farming methods so as to prevent the insects from securing food supplies by a judicious rotation of crops. On account of the fondness of this beetle for squash and pumpkins it is not desirable to plant these crops with corn. When the beetle occurs on the cucumber, squash, and other related plants it may be combated by the methods which are effective against the striped cucumber beetle or may be sprayed with some arsenical such as is used for potato beetles.

D. longicornis is less widely distributed than the southern corn root-worm. It is most troublesome in Indiana, Iowa, Kansas, Missouri, Nebraska, and Ohio. The larvæ of this species feed almost exclusively on corn but the beetles eat other plants. It is apparently single brooded. Losses from this pest may be largely averted by a suitable system of crop rotation.

Insects affecting turnips, P. LESNE (*Jour. Agr. Prat., n. ser., 5 (1905), Nos. 5, pp. 152–157; 6, pp. 178–181, pl. 1*).—Some of the insect pests of turnips and related plants are discussed with notes on their life history and on the most approved methods of combating the insects. The species discussed by the author include cabbage butterflies, cutworms, cabbage-root maggot, diamond-back moth, *Plusia gamma*, *Athalia spinarum*, etc. Brief suggestions are made regarding formulas for insecticides.

An insect borer in the vegetable ivory nut, M. HAGEDORN (*Allg. Ztschr. Ent., 9 (1904), No. 23–24, pp. 447–452, figs. 12*).—The nut of vegetable ivory is sometimes injured to a considerable extent by *Coccotrypes eggersii*, which is described as a new species. The insect is also illustrated in its different stages.

The curculio and the apple, C. S. CRANDALL (*Illinois Sta. Bul. 98, pp. 468–560, pls. 3, figs. 29*).—In all parts of Illinois some damage is done to apples every year by the plum curculio and apple curculio, the former species being most important in this respect.

The author presents a detailed discussion of the geographical distribution, habits, and life history of the plum curculio, with special reference to hints which could be derived from this study regarding the most effective means of insecticide treatment. The greatest percentage of pupæ was found at a depth of ½ in. in the soil, while 59 per cent did not burrow deeper than 1 in. The nature of the burrows and the period of pupation were carefully studied. The author describes, in connection with numerous illustrations, the injuries due to the feeding punctures and crescent punctures of plum curculio in apples. In one instance 716 apples were examined which showed 1,037 crescent punctures and 1,202 feeding punctures.

The apple curculio is also discussed, with notes on its habits and life history, including the egg, method of oviposition, number of eggs, period of incubation, feeding punctures, larvæ, and mortality during development. The characteristics of the 2 species of curculio are compared, with particular reference to the nature of the injury caused by them.

The author discusses the means of combating these pests. It is believed that serious injury to apples by curculios is generally due to neglect of pruning, cultivation, spraying, and fertilizing. The curculios may be combated by spraying with arsenicals 5 times during the season. Under favorable conditions this treatment will save from 20 to 40 per cent of the fruit. Fallen fruit should be destroyed, and the ground underneath infested trees should be thoroughly cultivated in order to destroy the insect in that situation.

The average period passed by the plum curculio in the ground is about 28 days. The majority of the new crop of insects are in the ground during July and August. Both larvæ and pupæ are delicate, and may be easily destroyed by exposure to air and sunlight. It is strongly recommended, therefore, that the ground should receive thorough shallow treatment for a period of about 30 days, beginning with July 10.

On an injury to fruits by insects and birds. The apple-tree measuring-worm, H. GARMAN (*Kentucky Sta. Bul. 116, pp. 63–81, pls. 9, fig. 1*).—Punctures are often observed in ripening grapes, peaches, and plums in Kentucky, and this injury becomes particularly important for the reason that it is accompanied with brown rot.

According to the author's observations this injury is not due to bees, but to tree crickets and in a less degree to green June bugs. Tree crickets (*Oecanthus angustipennis* and *O. niveus*) were found at night eating holes in a large number of plums,

grapes, and other fruit. These insects are believed to be the chief cause of damage, together with the green June bug (*Allorhina nitida*).

The author carefully worked out the life history of these pests. The green June bug may be combated by capturing the adult beetles. Poisoned baits and lantern traps are of no service. Moles are believed to assist in destroying the larvæ of this pest. An examination of rotting peaches and plums generally showed the presence of punctures in the skin due to tree crickets and June bugs.

In a discussion of the economic relation of birds the author presents notes on a number of common species. It appears that robins, catbirds, and mocking birds feed extensively upon grapes. The stomach of a summer redbird, examined by the author, contained nothing but insects. From a sentimental standpoint, the author believes that nearly all birds are worthy of protection, but from the standpoint of the entomologist it is probable that they do as much harm as good.

The apple-tree measuring-worm (*Ennomos subsignaria*) differs from the cankerworm, with which it is frequently confused. Both insects have been quite injurious for several years in Kentucky. The apple-tree measuring-worm may be distinguished from the cankerworm from the fact that it pupates among leaves on the trees and, therefore, after the moths have emerged, the empty pupa cases may be observed. Notes are given on the life history of this pest. The adult is white and may thus be distinguished from the cankerworm, which is gray. The best remedy for both insects is found in spraying with Paris green and arsenate of lead.

Report on the gypsy moth and the brown-tail moth, July, 1904, C. L. Marlatt (*U. S. Dept. Agr., Bureau of Entomology Circ. 58, pp. 12, maps 2*).—During July, 1904, the author made a tour of the parts of New England infested by these moths. The number of gypsy moths has been considerably reduced by the work of the Massachusetts State Board of Agriculture, and the area of infestation as observed by the author was essentially the same as it was at the close of the work of the State.

Brief notes are given on the general condition of colonies of gypsy moth in different parts of Massachusetts; the only infestation known in the United States outside of Massachusetts is in Providence, R. I. The author believes that the gypsy moth may be successfully controlled by the application of the remedies recommended by the Massachusetts State Board of Agriculture. Effective control requires concerted action over the whole infested territory. It was suggested that national aid in Massachusetts to the control of the gypsy moth might be directed to securing parasites and predaceous enemies of the gypsy moth in Europe.

The brown-tail moth is generally distributed in the region of Boston, and being a strong flier is spreading much more rapidly than the gypsy moth. The general trend of distribution is northward, and the insect has been found in Maine, New Hampshire, and even New Brunswick.

Natural enemies of the fruit fly, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 26 (1905), No. 1, pp. 84-87*).—Attention is called to the work of Compere in searching for parasites of *Ceratitis capitata*. This traveler believes that he has found an effective parasite which suppresses the insect in Brazil. The author intends to secure specimens of the parasite and test their value, but does not expect much assistance from the parasite in controlling the fruit fly.

Experiments with caustic soda and some patent washes against the San José scale, J. L. Phillips (*Virginia Sta. Bul. 152, pp. 61-67*).—The experiments reported in this bulletin were carried out as late as possible in the dormant season, viz, during the latter part of April. Some applications were made in the fall and a few during the summer.

Caustic soda was tested in strengths of 1 lb. per 1 to 6 gal. of water. It was found that when a solution of caustic soda strong enough to destroy the San José scale was used the trees were seriously injured. Similar results were obtained with Kilscale. The insects were not seriously affected by this remedy, while a 10 per cent solution

destroyed all the foliage on young apple trees and from 40 to 50 per cent of the foliage on old trees when applied in July and August. The cost of the material makes it unsuited for orchard work.

Con-Sol is a concentrated solution of lime, sulphur, and salt. It was applied at different strengths on April 22. This remedy appeared to be quite effective against San José scale when diluted in 4 times its volume of water. The cost, however, is too great for commercial work. A solution of the Con-Sol strong enough to kill San José scale seriously injures foliage if applied in summer.

A comparison of these remedies with lime, sulphur, and salt shows that the cost of the latter is about 1 ct. per gallon, that of Con-Sol 20 cts. per gallon, and that of Kilscale 15 to 16 cts. The lime-sulphur-salt wash is an effective remedy against the San José scale.

San José scale in West Virginia, F. E. Brooks and W. E. Rumsey (*West Virginia Sta. Spec. Bul. 3, pp. 135–141, figs. 6*).—Brief notes are given on the appearance, habits, life history, and means of combating this pest. The authors recommend the use of lime-sulphur wash for this purpose.

How to kill the San José scale, E. P. Felt (*Gard. Mag., 1 (1905), No. 1, pp. 22, 23, figs. 9*).—Brief notes are given on the remedies which have been found most effective in controlling this insect. In most localities lime-sulphur washes are considered the best insecticides for San José scale.

The Putnam scale, T. D. A. Cockerell (*Proc. Davenport Acad. Sci., 9 (1901–1903), pp. 61, 62*).—Brief notes are given on references to the early literature of this species, with an account of its distribution in New Mexico.

The grape phylloxera, J. M. Aldrich (*Idaho Sta. Bul. 46, pp. 7*).—This pest was first discovered in Idaho in 1901 and has since spread considerably despite the efforts to eradicate it. American grapes are chiefly affected on the leaves while European varieties are attacked on the roots. The occurrence of the winged brood has not thus far been observed in Idaho. On account of the long immunity in Idaho to the attacks of this pest European grapes were grown on their own roots and there are no vineyards grafted on American roots. It is believed that this operation will become necessary as a result of the spread of phylloxera.

Forest entomology, A. T. Gillanders (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 19–57, figs. 41*).—Attention is given in this article to a discussion of mites, plant lice, and scale insects injurious to forest trees.

A number of mites belonging to the genera Phytoptus and Eriophyes cause injuries to the leaves and other tissues of forest trees. The life history and habits of various plant lice and Coccidæ are discussed in considerable detail, some of the more important species being scurfy scale, oyster-shell bark-louse, *Asterolecanium variolosum*, *Cryptococcus fagi*, etc. For the destruction of scale insects the author recommends the application of a mixture containing caustic soda, pearl ash, soft soap, and water.

A remarkable plant louse on maples, B. Wahl (*Ztschr. Landw. Versuchw. Oesterr., 7 (1904), No. 11, pp. 793–796, fig. 1*).—A number of species of plant lice were observed on maples in the vicinity of Vienna. Particular attention is given in this article to *Chaitophorus testudinatus*. This insect is especially injurious to young trees, but may be quite harmful to all maples. The author recommends spraying with tobacco extract or kerosene emulsion.

Beetles attacking rubber, H. N. Ridley (*Agr. Bul. Straits and Federated Malay States, 3 (1904), No. 10, pp. 419, 420*).—Brief notes on a tiger beetle which attacks the shoots of Para rubber. Since these beetles are ordinarily carnivorous in their habits it is not clear whether this tendency to bite rubber plants is very general.

Mixtures and appliances for spraying, T. C. Johnson (*West Virginia Sta. Bul. 93, pp. 65–118, figs. 37*).—The usual difficulties met by fruit growers in spraying for insects and fungus diseases are briefly outlined.

Detailed directions are given for the preparation of various insecticides and fungicides, Bordeaux mixture, soda Bordeaux, copper-sulphate solution, ammoniacal carbonate of copper, potassium-sulphid solution, iron sulphate, and sulphuric solution, formalin, dust sprays, Paris green, white arsenic, arsenate of lead, hellebore, kerosene emulsion, hydrocyanic-acid gas, etc.

Recent experiments with soda Bordeaux indicate that this fungicide has considerable value. It may be prepared by adding commercial lye to a solution of copper sulphate until the mixture is perfectly neutral. If it is carelessly prepared it may be either acid or alkaline and will cause injury to the leaves. This danger may be avoided by adding lime at the rate of 1 oz. to 6 oz. of copper sulphate. In preparing the solution copper sulphate is ordinarily employed at the rate of 1 lb. to 10 gal. of water. Notes are also given on spraying apparatus.

Dust spraying in Delaware, C. P. Close (*Delaware Sta. Bul. 69, pp. 3–7*).—On account of the heavy dews which prevail during the season in Delaware the conditions are considered quite favorable for dust spraying. Various materials were tested for this purpose, but none was satisfactory except a combination of pulverized copper sulphate and hydrated lime to which Paris green or some other poison was added.

As a result of the experiments reported in this paper the author believes that a dust spray can be applied at about one-half the expense of a liquid spray. Applications were made before the buds began to swell and at other dates ranging from May 18 to June 24. Apple, pear, peach, plum, and cherry trees were sprayed. No injury was caused by this method of treatment. The codling moth and apple scab were successfully controlled by dust spraying. The author believes that for this method of treatment it is best to rely on some brand of hydrated lime, pulverized copper sulphate, and Paris green.

The horn fly, J. Spencer (*Virginia Sta. Bul. 153, pp. 71–77, figs. 5*).—The life history of this pest is briefly outlined. One of the remedies for controlling it consists in applying lime to cow manure in which the insect lives in the larval condition.

The author found that cows could be effectively freed from this insect by spraying with kerosene emulsion containing 2 gal. kerosene and ½ lb. soap per 1 gal. of water, the whole to be diluted with 5 parts of water before using. The swarms of horn flies were reduced to insignificant numbers by daily application for a period of 2 weeks. It was found that 15 gal. of the diluted kerosene emulsion were sufficient for treating 100 cattle.

The sheep maggot, with notes on other common flies, W. W. Froggatt (*Agr. Gaz. New South Wales, 15 (1904), No. 12, pp. 1205–1211; 16 (1905), No. 1, pp. 16–22, pls. 2*).—Notes are given on the habits, life history, and economic relations of *Calliphora oceanica*, *C. villosa*, blue bottle fly, house fly, stable fly, and several other related species.

For the destruction of the 2 first-named species the author recommends a suitable treatment of the material in which the flies breed and the use of whale-oil sulphur and other dips. In some cases the whale-oil sulphur dip was found to be of little value in treating lambs. Stockholm tar and sulphur were used in such cases. A brief bibliography relating to this subject is appended to the article.

Flies on ostriches (*Agr. Jour. Cape Good Hope, 26 (1905), No. 1, p. 8*).—In the Hopetown district a plague of flies occurred on ostriches causing them to become emaciated as a result of parasitism. These flies were identified as *Hippobosca struthionis*. The flies were found to succumb readily to the use of insect powder.

A swarm of bees under glass, A. Ronsseray (*Apiculteur, n. ser., 49 (1905), No. 2, pp. 68–71, figs. 2*).—A description is given of a method of construction of the comb and the forms of comb produced by a swarm of bees allowed complete liberty in this regard in a closed glass compartment containing a branch of a tree for attaching the comb.

A roller for piercing the cells of comb honey, SEXE (*Apiculteur, n. ser., 49 (1905), No. 2, pp. 79–81, figs. 2*).—A brief description is given, with illustrations, of an instrument designed for puncturing the caps of cells in order to stimulate the activity of the swarm.

Sericulture in connection with coffee raising (*Bol. Agr. São Paulo, 5. ser., 1904, No. 10, pp. 479–481*).—Attention is briefly called to the possibilities of mulberry culture and silk production in a profitable manner in connection with coffee plantations.

FOODS—NUTRITION.

Milling tests of wheat, H. SNYDER (*Minnesota Sta. Bul. 90, pp. 232–237, pls. 3*).—To test the relative quality of standard grades of wheat of the 1904 crop milling and baking tests were made with 10 samples representing various grades.

The yield of flour was found to be directly proportional to the weight of a bushel of cleaned wheat, the highest yield, 68.5 per cent total flour, being found with heavy, clean, high-grade wheat weighing 61 lbs. to the bushel. The lowest yield, 51.7 per cent, was obtained with rusted and rejected wheat weighing 49.5 lbs. per bushel. No material difference was observed in the protein content of the various grades of wheat, but the percentage in all the samples was unusually low. This, in the author's opinion, is due to climatic conditions, particularly an excess of rainfall during the latter part of the growing period. "An excess of water during the growing season appears to have a tendency to decrease the protein content of all grains."

The rusted wheat examined contained 12.5 per cent protein. Commenting on rusted wheats the author states that "there appears to be quite a wide range in the protein content of rusted wheats; some samples have been analyzed showing as low as 11 per cent and others as high as 19 per cent." The flour from the badly rusted wheat contained more total gluten and protein than flours from the standard grades of wheat, but it was lacking in desirable physical qualities, such as power of expansion and color. The gluten was abnormal in composition, as was shown by the low gliadin content of the flour.

The No. 1 grade wheats produced the largest loaf and best quality of bread, although the flours contained less protein and gluten than a number of other samples. The rusted wheat produced the poorest quality of bread. According to the author, light-weight rust-free wheat generally produces flour of fair quality with gluten of abnormal properties, although the yield of flour is low. "The light-weight wheat when badly affected by rust has had its bread-making qualities impaired so that it will not make a high grade of flour. . . . Owing to their poor milling and bread-making qualities and a tendency toward a high protein content the farmer will find the badly rusted wheat more valuable for feeding purposes than as a marketable crop."

The acidity of wheat in the Orléansville region, J. SARTHOU (*Rev. Serv. Intendance Mil. Paris; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 3, pp. 265, 266*).—The flour furnished the garrison at Orléansville had a high acidity, in general the wheat grown on mountains being more acid than that grown on lowlands. The method commonly followed of storing the wheat in pits is pointed out as a condition which would increase the acidity, as would also the method of milling followed.

Bread with superior keeping qualities, M. MANSFELD (*Jahresber. Untersuch. Anst. Allg. Österr. Apoth. Ver., 16 (1903–4), p. 11; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, p. 756*).—A material designed for use in making bread with superior keeping qualities was found to consist essentially of rye-starch paste with a small amount of salt and glycerin.

The effect of ozone on the baking quality of wheat flour, C. BRAHM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, pp. 669–673, fig. 1*).—The data reported call attention to the injurious effects of ozone as a bleaching agent on the

baking quality of flour, and have been noted from another publication (E. S. R., 16, p. 799).

Observations on a malt glucose, known as "Midzuame," made in Japan from rice and millet, F. H. STORER and G. W. ROLFE (*Bul. Bussey Inst., 3 (1904), No. 4, pp. 80–94*).—A summary of historical and other data regarding midzuame, together with the report of some tests carried on with this material and similar articles.

A note on Ame, Y. FURUKAWA, trans. by S. TAKAKI (*Bul. Bussey Inst., 3 (1904), No. 4, pp. 95–97*).—A translation from the Japanese of an article[a] published several years ago on ame, a food product said to be a mixture of maltose and dextrin.

The food value of sugar (*Abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 3, pp. 257–259*).—A summary of data presented before the *Société Centrale d'Agriculture de Belgique*, Mar. 16, 1904. The value of sugar for the production of energy and muscular work by man and animals and its importance in the formation of fat and milk were the principal subjects spoken of.

Sugar as a natural constituent of mace, W. LUDWIG and H. HAUPT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 4, pp. 200–204*).—The investigations reported have to do with the detection of the adulteration of mace with sugar. The authors conclude that sugar is a normal constituent of mace—the amount varying in different samples—and that this must be taken into account in examining mace for the presence of sugar as an adulterant.

Analyses of preserved egg products, P. WELMANS (*Pharm. Ztg., 48 (1903), pp. 665–667, 804; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 12, pp. 751, 752*).—Analyses are reported of the white and yolk of large and small eggs and of a number of preserved egg products. The manufacture of such goods is discussed.

The treatment of frying oils, F. JEAN (*Rev. Gén. Chim. Pure et Appl., 7 (1904), p. 326; abs. in Analyst, 30 (1905), No. 346, p. 21*).—The cause of frothing of vegetable oils used in cookery was studied.

It was found that when oil is heated to 230° C. the volatile constituents are driven off; the oil no longer froths and the acidity is reduced. When distilled with steam at 150° the oil froths considerably and an acid distillate is obtained. At 190 to 225° the frothing is reduced and solid particles are carried over, while above 225° the acidity increases. The distillate was found to contain allyl sulphid, aldehydes, and fatty acids. When oils were heated with various fruits to 170° and a current of air passed through the liquid there was no frothing.

Bleached and rancid fat, M. WINCKEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 2, pp. 90–96*).—The investigations reported led to the conclusion that the change brought about when fat is exposed to sunlight is different from that noted when it is kept in the dark (rancidity being excluded), though in both cases the changes are due to chemical action. Rancidity is brought about by the action of micro-organisms. Rancidity and the property of showing the phloroglucin-hydrochloric-acid reaction do not occur at the same time. Spoiled fat gives the phloroglucin-hydrochloric-acid reaction, but this is not dependent upon the rancidity. Spoiled butter fat does not undergo the same chemical change as other fats. The detection of rancidity and other points are discussed.

The artificial preparation of foods, M. BERTHELOT (*Kosmos, 1 (1904), No. 2, pp. 93–96*).—The possibilities of producing food products synthetically are discussed, and attention drawn to the limitations which must attend such attempts.

The use of formalin for preserving foods, O. LIEBREICH (*Ther. Monatsh., 18 (1904), pp. 59–61; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 11, p. 718*).—The author discusses the use of formalin as a preservative, and recommends that if used the fact should be plainly stated.

[a] Tokei Iji Shinshi, 1885, No. 364, p. 355.

Concerning sulphurous acid in composition, W. KERP (*Arb. K. Gesundheitsamte, 21 (1904), pp. 180–225; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 3, pp. 213–215*).—Studies of sulphurous acid and the forms in which it occurs with special reference to food products.

Colored legumes, WACKER (*Ber. Untersuch. Ulm, 1902–1904, p. 18; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 8 (1904), No. 7, p. 436*).—A small amount of green coloring matter, which was probably added chlorophyll, was obtained from green peas.

Swiss food book. I, Alcoholic beverages (*Schweizerisches Lebensmittelbuch. I, Die alkoholischen Getränke. Bern: Neukomm & Zimmermann, 1904, 2. ed., pp. 76; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 3, p. 190*).—The subjects included are beer, wine, and other alcoholic beverages, and vinegar. It is stated that this edition has been revised.

Complete analyses of northern Italian wines exhibited at the Paris Exposition, 1900, C. MENSIO and A. LEVI (*Staz. Sper. Agr. Ital., 37 (1904), No. 7–8, pp. 549–578*).—Over 200 samples are reported upon.

The phosphoric acid content of wines of northern Italy, C. MENSIO (*Staz. Sper. Agr. Ital., 37 (1904), No. 7–8, pp. 579–594*).—Data are reported regarding the phosphoric acid content of a large number of samples of wine.

Changes in the composition of wine due to clarifying with isinglass, gelatin, albumen, and Spanish earth, K. WINDISCH and T. ROETTGEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 9 (1905), No. 3, pp. 129–133*).—The authors studied the changes in composition of wine brought about by the use of different clarifying agents. From the analyses reported and other available data it appeared that the chemical composition of wine is only slightly modified by the clarifying agents, this being especially true in the case of isinglass and gelatin.

Principles of dietetics, H. LABBÉ (*Principes de diététique. Paris: J. B. Ballière & Sons [1904], pp. 330; rev. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 3, pp. 284, 285*).—Foods, the process of digestion, digestive ferments, principles of dietetics, and related topics are considered in this handbook.

Dietary studies with Harvard University students, E. MALLINCKRODT, Jr. (*U. S. Dept. Agr., Office of Experiment Stations Bul. 152, pp. 63*).—Dietary studies were made with 10 students living at Randall Hall, one of the large college commons of Harvard University. In every case the investigations covered 3 periods of 3 weeks each in the fall, winter, and spring.

Considerable variations were noticed with the different individuals and in different periods, but not greater than might have been expected. So far as it is possible to judge, the men appeared to be in bodily equilibrium on their various diets during the different periods; at least they showed no change in general physical condition that could be detected by careful medical examination.

On an average the diet furnished 86 gm. protein and 2,964 calories of energy, values which are smaller than those called for by the commonly accepted dietary standards. However, considered on the basis of body weight, the daily diet supplied 1.3 gm. protein and 45 calories of energy per kilogram body weight, i. e., a little less protein and a little more energy than called for by the standards referred to. The amount expended for food was small, being on an average 37.9 cts. per man per day.

The problems of rational nutrition and the measurement of available energy by the dynamometer devised by Charles Henry, A. GOY (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 2, pp. 125–131, figs. 4*).—A special form of dynamometer is described.

Duclaux' work and rational nutrition, C. NOURRY (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 2, pp. 154–173*).—A summary of the work of Duclaux in relation to nutrition. The author calls attention especially to that phase of the work which

has to do with the relation of digestive ferments and micro-organisms to the energy balance of the body.

The source of muscular energy, A. Trunz (*Fühling's Landw. Ztg., 53 (1904), Nos. 21, pp. 785–790; 22, pp. 838–843*).—A critical summary and discussion.

The general conclusion is drawn that protein, fat, and carbohydrates may all be sources of muscular energy. So long as nitrogen-free nutrients are supplied in abundance in the food or stored in abundance in the tissues they are used for muscular work. When they are no longer present protein is a source of muscular energy. Furthermore, it appears that the muscles utilize for muscular work not only the energy due to cleavage of nutrients, but also, owing to its affinity for the cleavage products, the oxygen which is present in muscles.

The way in which chemical energy is converted into muscular energy in the muscles is not definitely known. When more food is supplied than is required for maintenance only 33 per cent of the energy of the excess food materials, on an average, is converted into muscular work in the case of farm animals.

Gelatin as a substitute for proteid in the food, J. R. Murlin (*Science, n. ser., 21 (1905), No. 525, pp. 106, 107*).—At the December meeting of the New York Society for Experimental Biology and Medicine, the author reported the results of experiments on gelatin as a substitute for protein in food.

In tests with dogs, amounts of gelatin furnishing from one-fourth to two-thirds of the nitrogen required were fed, the remainder of the nitrogen being supplied by meat proteid. The rations were so arranged that the energy requirements were fully met by fats and carbohydrates. The protection of body protein was the same when one-fourth, one-third, and one-half of the nitrogen of the food were supplied by gelatin, the coincident protecting power of fats and carbohydrates being the same.

When the coincident protecting power of nonproteid food is increased by feeding larger percentages of carbohydrates and less fat, the author states that two-thirds of the nitrogen requirement of the body may be met by gelatin and nitrogen equilibrium maintained at the starvation level. The results were confirmed, it is said, in experiments with man.

The physiological effects of peptone and allied products. VI, The metabolism of arginin, W. H. Thompson (*Jour. Physiol., 32 (1905), No. 2, pp. 137–146*).—In experiments with dogs it was found that arginin fed as chlorid or carbonate caused an increase of nitrogen in the urine. The greater part of the nitrogen, 72.8 to 96.3 per cent, appeared as urea.

In laboratory tests only half the nitrogen was obtained as urea, the other half being obtained as ornithin. In the animal body either ornithin is not formed, or if formed is reconverted for the most part into urea. Much the same effects were obtained when arginin was administered by hypodermic injection, except that more nitrogen was excreted in the urine than could have come from the arginin given. The excess of nitrogen did not appear to be caused by the solvent employed, consequently one must assume, according to the author, that arginin stimulates nitrogenous metabolism.

The nutritive value of the cleavage products of albumin. I, The energy involved in digesting meat and somatose, W. Cronheim (*Arch. Physiol. [Pflüger], 106 (1904), No. 1–2, pp. 17–42, dgms. 2*).—From experiments in which the respiratory quotient was determined the author concludes that as much as 30 gm. of somatose can be taken without causing digestive disturbances, and that this quantity is digested with less labor than an equivalent amount of meat.

On the relation of enterokinase to trypsin, W. M. Bayliss and E. H. Starling (*Jour. Physiol., 32 (1905), No. 2, pp. 129–136*).—The following is quoted from the author's conclusions based on experimental work:

"There is no evidence that a solution of trypsin is equivalent to a combination of kinase and trypsinogen. Trypsin is a new substance, differing from trypsinogen, and

produced from the latter by the ferment-like action of enterokinase. There is no evidence that the enterokinase is essential to or takes any part in the proteolytic activities of trypsin."

The physiological rôle of glycogen (*Rev. Franç. Méd. et Chirurg., 1904, No. 35; abs. in Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 3, pp. 279–281*).—According to the author's summary glycogen has two important properties—first, it is a source of energy and a powerful exhaustive of functional activity, and second, it has antitoxic properties.

The influence of food on respiratory combustion, LAULANIE (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), Nos. 35, pp. 548–551; 36, pp. 579–584; 58 (1905), No. 3, pp. 115–121*).—Data are reported regarding the effects of different classes of food on the consumption of oxygen.

As shown by the amount of oxygen consumed in tests with dogs, combustion in the body is much increased 3 hours after taking food; in fact, the increase is noticeable immediately after eating. Except with small rations (400 gm. of meat), the intensity of combustion increased to the twelfth hour, when it reached its maximum. It then decreased, reaching a minimum 24 hours after food was taken. In the case of sugar the maximum combustion was found in 3 hours. It is apparent, therefore, that combustion in the body depends upon the quantity and quality of the food taken, and the author believes it fair to conclude that oxygen consumption is a measure of the work of digestion.

A method of determining a maintenance ration is proposed which depends upon a comparison of the oxygen actually required and the theoretical amount, that quantity of food being sufficient for maintenance which shows in 24 hours an actual oxygen consumption just equal to the theoretical value required for complete combustion of the food, body weight being maintained.

In a test reported, which was made with a dog weighing 15 kg. fed horse meat, the oxygen consumed ranged from 120.128 liters when fasting to 278.626 liters when 2,000 gm. was eaten. The theoretical amount of oxygen necessary for the consumption of the food ranged from nothing to 500 liters. The corresponding difference between the theoretical and actual amounts of oxygen ranged from −120.128 to +221.374. Platting the curves of the results obtained the author calculates that 620 gm. of meat represents the quantity at which oxygen equilibrium would be reached. In a similar experiment in which milk soup was fed the amount required for maintenance was calculated to be 387.32 gm. The value of this method is discussed.

On the interrelationship of calcium and magnesium excretion, J. MALCOLM (*Jour. Physiol., 32 (1905), No. 2, pp. 183–190*).—The experiments reported were made with dogs. According to the author, "considerable evidence is brought forward to show that the ingestion of soluble magnesium salts causes a loss of calcium in adult animals and hinders its deposition in young growing animals, while soluble calcium salts do not in the same way affect the excretion of magnesium."

Practical exercises in chemical physiology and histology, H. B. LACEY and C. A. PANNETT (*Cambridge: W. Heffer & Sons; London: Simpkin, Marshall & Co., 1904, pp. 112; rev. in Lancet [London], 1905, I, No. 14, p. 936*).—A compilation of practical exercises in chemical physiology and histology, designed for the use of students.

ANIMAL PRODUCTION.

The composition of Ontario feeding stuffs, W. P. GAMBLE (*Ontario Agr. Col. and Expt. Farm Bul. 138, pp. 32*).—With the object of securing data regarding the composition and quality of local feeding stuffs, samples of by-products were collected from flour, oat, pea, and starch mills, and from other sources. Some samples of proprietary feeds and staple feeding stuffs were also collected.

The feeding stuffs analyzed include a number of samples of pea meal, pea hulls or pea bran, mixed chop, wheat middlings, wheat bran, low-grade flour, shorts, crushed wheat, "bees' wing" (i. e., outer layer wheat hull), cotton-seed meal and hulls, linseed meal, gluten meal and feed, corn chop, corn bran, silage and fodder, oat hulls or bran, oat dust, siftings, feed and oatmeal, mill feed, barley dust, malt sprouts, barley, dried molasses beet pulp, poultry feeds, stock foods, and stock-food ingredients, i. e., sphagnum moss and beet sugar molasses. The feeding stuffs were also submitted to microscopical examination.

The pea meal had on an average the following percentage composition: Water 10.34, protein 23.27, fat 1.90, nitrogen-free extract 54.62, crude fiber 7.04, and ash 2.83 per cent. The average percentage composition of pea hulls was, water 7.51, protein 10.04, fat 1.44, nitrogen-free extract 36.01, crude fiber 42.07, and ash 2.92 per cent. Some of the conclusions follow:

"Only a few cases of actual adulteration have been found among the samples examined. In every instance the adulterated sample was forwarded to us by a feeder of live stock.

"A considerable number of by-products, such as corn bran, oat hulls, and oat feed, etc., are of such inferior quality that they can not, as a rule, be used to any profit. . . .

"At the present time the prices asked for cattle foods bear very little relation to their feeding value. That is, feed is retailed at so much per ton whether it is rich in protein and well suited to supplement our ordinary farm foods, or whether it is a starchy food, and therefore of much less value in compounding suitable rations for cattle. Such being the case, special care in the purchase of feeds and some knowledge of their chemical composition will be found of paramount importance in keeping the cost of feeding down to a point which will admit of a profit. . . .

"Pea meal, linseed meal, maize gluten, gluten feed, middlings, and wheat bran are by-products which contain a large quantity of protein, and are therefore most valuable components for a ration intended for dairy cows. For fattening pigs good results have been obtained from a mixture of skim milk and low-grade flour. Shorts is an excellent food for young pigs. Oat dust and other feeds of like composition, if pure, furnish nutritive materials at economical prices. . . .

"Regarding mill feed, oat hulls, and such low-grade materials little need be said. The [data reported] show them to be entirely unfit to feed as substitutes for pea meal, linseed cake, and such nitrogenous materials. There are cases, however, in which these feeding stuffs might be used to advantage, but the feeder is likely to be misled in the purchase of these materials, because the price asked, judged from the cost of standard food materials, would indicate value which they do not possess."

A table is given showing the calculated amount of digestible nutrients furnished by different weights of a number of feeding stuffs.

The composition of rice by-products, G. S. FRAPS (*Texas Sta. Bul. 73, pp. 14, map 1*).—Rice milling is described and a number of analyses of rice by-products, including hulls, polish, and bran, are reported. The feeding value and digestibility of rice products are discussed, and standards for rice bran suggested. The author's summary follows:

"Rice hulls have a low feeding value; their composition approximates that of wheat straw, but it has less value.

"Rice polish has a slightly higher feeding value than corn, and is about equal to oats or wheat.

"Three classes of so-called rice bran are sold in Texas; pure rice bran, consisting of cuticle of the grain mixed with a small amount of hulls incidental to the process of milling; rice bran mixed with rice hulls; rice bran, rice polish, and rice hulls mixed. This confusion will eventually damage the trade.

"Pure rice bran should contain not less than 10 per cent protein and 6 per cent fat, or more than 20 per cent crude fiber.

"Pure rice bran is slightly superior in composition to corn meal.

"Any addition of rice hulls lowers the feeding value of the mixture.

"Commercial rice bran may contain as low as 4 per cent protein, and as high as 50 per cent crude fiber.

"The mixture of bran, polish, and hulls in the proportions in which they come from the grain will contain about 7.5 per cent protein and 28 per cent crude fiber, and has a little over half the value of pure bran.

"Mixtures of rice bran with rice hulls, or with hulls and polish, should be sold under their true names, and on their own merits, and not under the name and on the merits of a superior article."

Inspection of feeding stuffs in 1904, F. W. Morse (*New Hampshire Sta. Bul. 116, pp. 8*).—Under the provisions of the State feeding stuff law analyses were reported of cotton-seed meal, linseed meal, gluten meal and feed, dairy feed, hominy meal and feed, and wheat, oat, and corn and oat feeds. Of the 50 samples examined 5 showed marked deficits in protein or fat.

"Two samples of cotton-seed meal were low in protein; but one of them was exceptionally high in fat, which in a measure offset the deficit. A sample of linseed meal showed a similar deficit in protein, partially made good by an excess of fat. A sample of hominy feed was unreasonably low in both protein and fat, and a sample of beef scraps was low in protein only. One sample of gluten feed unaccompanied by a guarantee was much lower than the average in protein, but was retailed at as high a price as the others.

"The prices of the different kinds of feeds should be carefully considered by the purchaser. They are apparently based on the demand for certain classes of goods and are made as high as the market will bear. They frequently are out of proportion to the intrinsic value of the material and vary widely in different localities for the same kind of feed."

Condimental, tonic, and other stock foods, W. Frear (*Pennsylvania Sta. Bul. 70, pp. 7*).—Chemical and microscopical analyses of a number of condimental and tonic stock foods and proprietary feeds are reported. According to the author, "whatever claims may be advanced for the tonic effects of the usually minute quantities of tonic substances in the condimental foods, or for the shell-producing qualities of the lime of the poultry powders, it is clear that well-known materials are used in compounding these proprietary articles, that the farmer can easily make for himself simple tonic mixtures, and that the prices asked for these proprietary preparations are enormously beyond their commercial worth."

A milk and butter purifier which it was claimed by the makers would remove the taint of silage, garlic, etc., was found to contain saltpeter as the active agent, with some charcoal and common salt.

Poisoning from feeding rape-seed cakes, V. Stein (*Ugeskr. Landm., 49 (1904), No. 13, pp. 167–169*).—Cases of diarrhea caused by feeding rape-seed meal of South Russian origin to milch cows were traced to the presence of castor bean meal in the shipment.—F. W. WOLL.

Concerning the peanut, W. Mooser (*Landw. Vers. Stat., 60 (1904), No. 5–6, pp. 321–346, figs. 2*).—The author identified a poisonous alkaloid in peanut cake which, so far as his investigations showed, was always present in this material. He was unable to secure samples of fresh seeds for study, and so it is uncertain whether or not they also contain the alkaloid. Further studies of the alkaloid and related questions are promised.

Colorado hays and fodders. Digestion experiments, W. P. Headden (*Colorado Sta. Bul. 93, pp. 44*).—The digestibility of corn fodder, saltbush, and hay from alfalfa, timothy, and native grasses was studied in experiments with sheep, an

experimental period of 5 days in every case following a preliminary period of 7 days. In all the tests the coarse fodders studied constituted the entire ration. The average coefficients of digestibility follow:

Average coefficients of digestibility of coarse fodders. Experiments with sheep.

	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Corn fodder, cut quite immature	58.56	47.38	45.91	57.60	67.87	42.84
Corn fodder, cut when mature	56.66	36.04	66.08	60.60	56.71	43.64
Alfalfa hay, inferior quality	52.04	66.69	90.85	56.69	47.76	45.65
Alfalfa hay, medium quality	63.95	72.54	29.86	72.89	49.93	57.67
Native hay, mixed grasses, 1st series	59.78	60.90	47.09	62.01	61.36	43.32
Native hay, mixed grasses, 2d series	50.53	62.33	20.55	51.30	55.56	42.52
Timothy hay, superior quality, average 2 series	53.87	50.86	50.60	58.89	45.34	49.88
Sorghum fodder	59.88	59.46	47.14	62.51	64.88	17.64
Saltbush	46.25	66.36	52.34	49.16	8.29	71.55

Attention is called to the fact that the coefficients of digestibility of the Colorado feeding stuffs are somewhat lower than those obtained in other regions with similar materials. The author believes, however, that the results are in very close accord with facts and tentatively suggests that the Colorado hays and fodders actually have a lower coefficient of digestibility than the same fodders grown elsewhere. The reason for this is not known, but he suggests that it may be due to the method of preserving fodders together with climatic conditions. "[Colorado] fodders are seldom preserved under cover, but in stacks or shocks, out of which they usually come as green, bright, attractive looking hays and fodders. They have, however, been exposed to our changes of temperature, our dry air, and continuously strong light."

Commenting on the results of the test as compared with popular opinions, the author calls attention to the fact that native hays are highly esteemed as horse fodders, being considered as good or better than timothy hay and commanding the same price in market. Furthermore, both timothy and native hay are preferred to alfalfa, especially for livery horses and road animals.

These opinions as to the relative values of the different hays are not borne out by the results of the experiments with sheep. The animals fed alfalfa hay made a gain of 3 lbs. each, and while on timothy scarcely maintained their weight. On native hay somewhat better results were obtained, the gains ranging from 0.5 to 2.5 lbs. per head in the 5 days of the digestion experiment proper. On corn fodder, which was finely cut with a hand cutter before feeding, the gain ranged from 0.5 to 2 lbs. per head. On the sorghum fodder the sheep lost from 2.5 to 3 lbs. each. "[Sorghum hay] might have greater value if fed in the fall or early winter, but the experiments with it gave disappointing results so far as its feeding value was concerned."

Attention is called to the fact that with the exception of crude fiber and total dry matter the results of the digestion experiments with saltbush are quite favorable, yet it was not satisfactory when judged by the weight of the sheep, there being a loss of 0.5 to 6 lbs. in 5 days. On this fodder the animals were very thirsty, drinking from 10.5 to 15 lbs. of water per day as compared with 1.5 to 4.5 lbs. when fed native hay, to which a small amount of salt was added. On saltbush the quantity of urine was large, and it had a very bad odor.

The anomalous values obtained for fat in the digestion experiments, especially for alfalfa hay, are discussed. According to the results obtained, 30 to 35 per cent of the ether extract of feces from alfalfa hay consisted of chlorophyll and related substances. Special attention was paid to the determination of fat and several solvents were tested. Definite conclusions were not drawn.

Digestion experiments with sheep and steers, J. M. BARTLETT (*Maine Sta. Bul. 110, pp. 185-208*).—Following the usual methods the digestibility of timothy hay, mixed hay, hay largely timothy, corn fodder, corn silage, soy bean and corn silage, spring-wheat bran, mixed feed from winter wheat, coarse and fine corn meal, cotton-seed meal, wheat middlings, and a mixture of corn meal and linseed meal was studied with sheep and with steers.

In addition digestion experiments with clover silage and clover hay were made with sheep, and with feed flour, linseed meal, and gluten feed with steers. Some of the average results follow:

Average coefficients of digestibility obtained with sheep and steers.

	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Timothy hay:						
Sheep	48.1	33.3	27.3	55.8	44.8	30.7
Steer	54.9	35.3	35.7	59.4	54.8	41.5
Corn fodder:						
Sheep	64.9	46.7	59.3	68.2	69.9	18.6
Steer	72.9	56.9	72.3	74.4	79.8	48.7
Corn silage:						
Sheep	60.0	50.9	75.5	65.0	57.8	33.3
Steer	63.1	46.7	68.3	64.1	67.2	31.7
Soy bean and corn silage:						
Sheep	71.4	62.6	90.3	76.8	65.1	42.7
Steer	70.5	56.4	90.0	77.5	61.7	31.3
Coarse corn meal:						
Sheep	83.5	46.0	....	80.3	....	....
Steer	83.6	45.1	....	90.3	....	....
Fine corn meal:						
Sheep	89.2	63.2	....	88.6	....	....
Steer	86.7	50.6	....	91.3	....	....

Considering the results as a whole the author calls attention to the fact that the steers had a greater capacity than the sheep for digesting coarse feeding stuffs low in protein, such as timothy hay and corn fodder.

"The more nitrogenous rations were as well and in some cases better digested by the sheep than by the steers, and the addition of nitrogenous grains to the ration appeared to materially increase the sheep's digestive capacity.

"The feeding of grain rich in protein with corn meal apparently increased the digestibility of the ration, particularly that of the protein.

"It is evident from a study of these results and others before published that as great differences in digestion coefficients will occur between sheep, individually, as is likely to occur between sheep and steers. But if sheep are to be used to determine coefficients for bovines, great care should be taken to select strong animals that are good feeders and will eat coarse fodders readily, otherwise results which are too low are likely to be obtained."

In connection with the digestion experiments the income and outgo of nitrogen was determined.

Methods of analyzing the entire animal body, A. E. VINSON (*Inaug. Diss., Univ. Göttingen, 1904, pp. 76*).—The work of earlier investigators which has to do with slaughter tests is summarized and data reported regarding the methods of determining different constituents of flesh and fat, and the results of studies of fat from pigs fed sugar, meat meal, and peanut oil as compared with that of pigs fed a normal ration.

The author recorded the total amount of the different kinds of fat, the total flesh, bones, and some similar data, and studied the character of the different sorts of fat and of the heart and heart fat with special reference to the effect of the different feeding stuffs tested. A comparison of the iodin numbers shows that the fat found withing the skeleton—for instance, the kidney, intestine, and heart fat—is different

from that outside the skeleton. On the other hand, the iodin number of the fat from the heart and from the bones was like that from the fat on the outer portion of the body. The author regards the iodin number found for the bacon fat from the pigs fed peanut oil, 71.2, as doubtful.

On an average the heart and the heart fat of the pigs fed meat meal contained the largest percentage of water. The pigs fed the ration containing sugar were the only ones in which the amount of heart fat was considerably increased. In the case of the meat-meal ration the total weight of heart fat was fairly high, but it contained a high percentage of water and a low percentage of fat. The heart itself did not differ much from that of pigs fed the normal ration. The heaviest heart was found in the case of pigs fed peanut oil, but the author points out that it is uncertain whether this was due to individuality or to the ration. This ration also produced the most lean flesh.

From the investigations as a whole the author considers it probable that a ration very rich in carbohydrates tends to the production of fat in and around the heart, while this is not the case with a ration rich in fat.

Experiments with hand-fed calves, D. H. OTIS (*Kansas Sta. Bul. 126, pp. 163–198, figs. 14*).—Skim milk with different supplements, skim milk substitutes, and related topics are studied in the extended series of tests with calves. There was usually 10 animals in a lot and the tests covered from 50 to 154 days, being on an average not far from 120 days in duration.

Considering 13 of the experiments in which skim milk was fed with grain and coarse fodder, the average daily gain was 1.58 lbs. per head, a pound of gain requiring 8.58 lbs. skim milk, 1.24 lbs. grain, and 3.87 lbs. coarse fodder. When calves are worth, respectively, $3, $4, and $5 per 100 lbs. the author calculates, on the basis of the experimental data presented, that the corresponding values for skim milk are 19, 31, and 43 cts. per 100 lbs. Taking account of the food and labor, the calculated cost of raising a skim-milk calf is $7.43, or omitting the cost of labor, $5.30. It was found that there was no difference between the gains made by the calves which consumed their milk slowly from calf feeders and those drinking it rapidly from a pail. The need of gradually substituting skim milk for whole milk is spoken of.

In the individual tests, the majority of which are included in the average referred to above, a number of questions were studied. It was found that calves fed whole milk made an average daily gain of 1.86 lbs. per head in a period covering 154 days, as compared with 1.51 lbs. in the case of a lot fed skim milk under much the same conditions. In a somewhat shorter period calves running with their dams gained on an average 1.77 lbs. per day.

When the effect of adding rennet to skim milk was studied it was found that the average daily gain with rennet was 1.37 lbs. and without it 1.34 lbs. A little more grain and milk and a little less coarse fodder was consumed when rennet was not used. Comparing buttermilk and skim milk, it was found that the gains were respectively 1.79 lbs. and 2.02 lbs., 8.7 lbs. buttermilk being consumed per pound of gain as compared with 7.8 lbs. skim milk. "The experiment shows beyond a doubt that calves can be successfully raised on buttermilk. In this experiment the buttermilk calves had less trouble from scours than the skim-milk calves."

When whey was fed the average daily gain was 1.06 lbs. per head as compared with 1.33 lbs. in a lot fed skim milk under practically the same conditions. At the end of 6 weeks the calves fed whey were strong and healthy and had good appetites. From the results of this test and the experience of feeders in cheese-making districts the author concludes that whey is a fairly satisfactory substitute for skim milk, provided it is combined with other foods and the calves are carefully watched.

The average daily gain was 0.86 lb. per head when tea made from mixed hay was fed with grain and coarse fodder, and 0.36 lb. when tea made from alfalfa hay was fed with much the same amounts of grain and some skim milk in addition. The

alfalfa-hay tea, the author notes, was decidedly laxative in effect, and it was almost impossible to keep the calves from scouring.

The relative value of different grains as part of a ration was studied in a number of the tests. On corn chop the average daily gain was 1.59 lbs. as compared with 1.74 lbs. on shelled corn, and on whole Kafir corn it was 1.44 lbs. as compared with 1.58 lbs. on ground Kafir corn. Ten calves on a full-grain ration gained 1.34 lbs. per head per day in a test covering 140 days as compared with 1.14 lbs. made by calves fed a three-quarters grain ration and receiving more skim milk than the other lot.

A mixture of equal parts of shelled corn and ground Kafir corn was compared with a mixed ration containing shelled corn, ground Kafir corn, whole oats, bran, oil meal, and dried blood, the gain per head per day in the 2 lots being 1.74 lbs. and 2.02 lbs., respectively. In a test of the value of dried blood and of Blachford's sugar with flaxseed the average daily gain was 1.69 lbs. and 1.77 lbs., respectively, as compared with 1.77 lbs. in the case of a control lot fed practically the same quantities of grain, skim milk, and coarse fodder.

"Although dried blood serves an excellent purpose as a tonic, it did not prove, in this experiment at least, of any particular value as a feed. The calves did not like the taste of dried blood when used in large quantities, and when too much was mixed with the grain they refused to eat the mixture."

Satisfactory gains were made on the proprietary feed with flaxseed, but no better than in the case of the control lot fed shelled corn and ground Kafir corn.

The newly erected calf sheds at the Kansas Agricultural College are briefly spoken of, as well as the advantages of different methods of tying calves. Some data are also given regarding dehorning and the treatment of scours, and other questions of calf management are also considered. Some of the general conclusions follow:

"When calves are fed for future usefulness in the dairy, care should be taken not to get them too fat. In the early part of the feeding period, when the calves are receiving a large amount of skim milk and comparatively little grain, there is not much danger of getting them too fat, but as the grain ration increases it may be necessary to feed more nitrogenous grain. This can be done by changing a part of the corn or Kafir corn for oats, bran, or oil meal whenever the calves appear too fleshy."

As regards the comparative merits of weaning gradually or at once the tests reported show that there is practically no difference in the two methods, judging by the gains made.

"The results detailed in this bulletin ought to be a conclusive argument as to the great feeding value of skim milk; they also indicate the possibility and even the advisability of growing the feeds that are needed upon the farm, thus saving the money that would otherwise be invested in high-priced feed stuffs. They indicate how it is possible to realize more income from the cow and consequently greater income per acre of land—an important feature as the value of land increases. The results likewise indicate the extravagance of letting a calf nurse a good cow. It will not only eat its head off by the butter fat it consumes, but it may materially lessen the production of the cow."

Present methods of beef production, II, H. W. Mumford and L. D. Hall (*Illinois Sta. Circ. 88, pp. 7*).—Various questions connected with the fattening of beef cattle are discussed on the basis of replies received from a large number of correspondents. Rating corn at 35 cts. per bushel and hay at $8 per ton the consensus of opinion was that a margin of $1 to $1.50 per cwt. in selling price over cost price is necessary in order that the returns may equal the expense of feeding.

As regards the season preferred 46.5 per cent of those from whom answers were received marketed cattle between December and March, while the remainder were rather evenly divided in their preference for the other months. Over half the corre-

spondents considered 5 or 6 months as the proper length of time for a fattening period. Data were accumulated on the amounts fed to cattle of different ages at different seasons. "In general heavier feeding is practiced in winter than in summer on grass. This difference is much less marked, however, in the case of yearlings than with older cattle. It is apparent that the common rule 'a half bushel of corn to a full feed,' places the average much higher than that followed in common practice."

As regards the daily gains when on full feeds the average of all replies received was 2.7 lbs. per day for cattle in summer on grass, and 2.23 lbs. per day in winter. As regards the amounts of feed required per pound of gain the average values given were 9.24 lbs. grain and 4.28 lbs. hay. Ninety-two per cent of the correspondents gave the steers all the coarse fodder they would eat during the fattening period and 41 per cent of those from whom replies were received made a practice of changing the coarse fodder in order to induce the steers to eat large amounts.

Considerable difference of opinion was expressed as to the number of cattle which can be advantageously fed together. "One of the most successful cattle feeders in Illinois reports that 2 carloads should be the maximum number fed in one lot, and that one load is preferable, his thought being that cattle are more quiet in small numbers and in uniform grades."

Bullock feeding experiments (*Mark Lane Express Agr. Jour., 92 (1905), Nos. 3823, p. 24; 3824, pp. 56, 57*).—Experiments carried out by the University of Leeds and the Yorkshire Council for Agricultural Education, beginning in 1901, are summarized. These had to do with the possibility of substituting molasses for roots, the comparative value of pulp and sliced roots in feeding steers, and the value of gluten feed and meal. The general conclusions drawn were in effect as follows:

It would seem from these experiments that molasses, although much relished by stock, can not satisfactorily take the place of roots in a fattening ration. Further experiments, however, are desirable to determine whether equally good results might not be obtained from molasses as from roots if the bulk given in each case were the same. Molasses, however, may serve a useful purpose in the wintering of young stock when roots are scarce.

It does not seem that gluten feed possesses feeding properties equal to a mixture of undecorticated cotton cake and barley meal.

As better results were obtained from sliced than from pulped roots, it would seem that the extra trouble involved in the case of the latter is not warranted.

Experiments with gluten feed, J. Hendrick (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 1-19*).—In a test made with 3 lots of 10 steers each gluten feed was compared with a mixture of gluten feed, feeding cake, and oats, and a mixture of the cake and oats, all the lots receiving Swedish turnips and oat straw in addition to grain.

In 90 days the average daily gain on the gluten feed ration was 2.26 lbs. per head, on the mixed ration containing gluten feed 2 lbs., and on the mixed ration without gluten feed 1.8 lbs. As shown by the results of the block test the percentage of dressed weight did not vary materially in the 3 lots. Analyses of the feeding stuffs used are reported. Four other feeding tests with steers which compared gluten meal with crushed oats, cotten-seed cake, or oil cake are also briefly noted, as well as some studies with pigs and dairy cows.

From the investigation as a whole the author notes that for steers gluten feed compares favorably with bruised oats, mixed cake and oats, mixed cotton-seed cake or oil cake, and discusses the best methods of feeding it for pigs. The conclusion was reached that "gluten feed used alone is not a suitable food on which to fatten pigs. It tends to make them costive. When mixed with some more open food it is greatly improved, fattens pigs about as well and as rapidly as barley meal similarly mixed,

and fattens them on rather less food, but does not produce quite so good a carcass of pork." With milch cows gluten feed "did not give quite such good results as an equal weight of decorticated cotton-seed meal similarly fed."

Report of the agriculturist, W. L. CARLYLE (*Colorado Sta. Rpt. 1904, pp. 101–105*).—Brief notes are given regarding feeding tests with steers, lambs, and pigs, and plans for experimental work in horse breeding are spoken of.

In a test made with 3 lots of 50 steers each, rations of beet pulp and alfalfa hay with and without grain were compared. The greatest gains were made by the lot fed corn in addition to the basal ration and the least gains by the lot fed no grain. The greatest profit, $16.60 per steer, was noted with the lot fed no grain, and the least, $12.55 per steer, with the lot fed barley and oats. When 100 lambs were pastured for 7 weeks on field peas ready for harvesting the average gain was 17 lbs. each.

To secure data of interest to those engaged in the pig industry an accurate account was kept of the cost of feed eaten and the gains made by 10 sows and their pigs. Deducting the first cost of the sows and the cost of feed while nursing the pigs, they returned a profit of $31.25. The pigs were fed in 3 lots of 24 each, one lot being pastured on alfalfa, one on rape, and one on barley and field peas. Mixed grain was fed to all the lots in addition to pasturage. On an average 3.5 lbs. of grain was required per pound of gain. The profit on the pigs was $248.55.

The improvement of poor pastures (*Jour. Bd. Agr.* [*London*], *11* (*1905*), *No. 10, pp. 608–613*).—The results of experiments are summarized which were carried out by the agricultural department of the University of Cambridge at Cransley, Northampton, on the improvement of pasturage manured in different ways, as shown by the gains made by sheep grazed on sample plats.

In the 3 years the greatest total gain in live weight, 337.2 lbs., was made by the sheep pastured on the land manured by feeding decorticated cotton-seed cake for 2 years. The smallest gain, 158.9 lbs., was made on the pasture which was not manured.

The chief lesson which may be drawn from the investigation, it is stated, is that on clay soils the improvement of poor pastures must begin with a heavy dressing of basic slag, no other manure being usually necessary. It is essential, however, that the pasture contain clovers, otherwise the basic slag will not be of use. The quantity of manure will vary according to circumstances, 7 to 10 cwt. per acre being the usual amount. The ultimate improvement, it is stated, will depend on the extent to which clover grows during the first year or two.

Improvement of hill pasture as determined by the effects on stock. Experiments in Scotland, D. WILSON (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17* (*1905*), *pp. 271–295*).—Tests carried on in different localities of Scotland are briefly reported in which the improvement of pastures treated with different fertilizers was tested by pasturing sheep on sample plats. Definite conclusions were not drawn and the experiments, it is stated, will be continued.

Equipment for breeding, feeding, care, and management of swine, R. S. SHAW (*Michigan Sta. Bul. 223, pp. 98–116, figs. 2, dgms. 12*).—The college piggery is described and details of plans for the construction of buildings, cots, yards, fences, etc., are given.

Forage crops for swine, R. S. SHAW (*Michigan Sta. Bul. 223, pp. 117–124, figs. 3*).—Tests of the feeding value of a number of forage crops, including a mixture of grains and peas, peas and oats, sugar beets, and mangel-wurzels are briefly reported. The test is regarded as preliminary.

An analysis of a mixed crop of millet, rape, corn, oats, and peas is reported, but no data are given regarding the gains made by the pigs pastured on the crop. The mixture when used as a soiling crop for dairy cows gave excellent results and the small amount of rape present apparently had no effect harmful on the milk. When

pastured on one-third of an acre planted to peas and oats, 7 pigs gained 70 lbs. in 27 days, or at the rate of 210 lbs. of pork per acre.

In a second test the gain was at the rate of 166.5 lbs. per acre. When pastured on a plat planted to sugar beets and fed some grain in addition 16 pigs gained 584 lbs. in 40 days, the estimated gain on the beets only being at the rate of 715.5 lbs. per acre. In a similar test on a plat planted to sugar beets and mangel-wurzels the gain due to roots was calculated to be 792 lbs. per acre.

As pointed out by the author, pasturage for brood sows during the growing season is generally regarded as very desirable and the value of June grass and rape for this purpose was tested with 5 dry sows. No supplementary feed of any sort was supplied. Some of the animals gained a little and others lost, but on an average there was an increase of 2 lbs. in weight.

Tankage and other by-products for pigs. Shrunken wheat for swine, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 90, pp. 12*).—Using 7 lots of 6 pigs each the relative feeding value of tankage, blood meal, linseed meal, ground flax, and skim milk, fed in addition to ground barley and one-fourth acre rape pasturage, were tested in comparison with a ration of barley alone.

During the whole test, which covered 84 days, the average gain on barley was 102 lbs., 5.77 lbs. of feed being required per pound of gain at a cost of 3.91 cts. On the other rations the gain ranged from 109 lbs. on barley and rape to 151 lbs. on barley, skim milk, and rape. The greatest range in the cost of a pound of gain, 3.92 cts. to 4.51 cts., was also noted with these 2 lots. The smallest amount of feed per pound of gain, 4.62 lbs., was noted with the lot fed oil meal, and the largest quantity, 15.34 lbs., with the lot fed barley and skim milk.

In discussing the feeding value of rape attention is called to the fact that the lot on barley and rape gained 46 lbs. more than the lot fed barley only, the amount of grain consumed being practically the same in the 2 cases.

During the past season a considerable amount of wheat in the northwestern United States was more or less damaged by rust and its value lessened for milling purposes. The feeding value of 2 lots of this shrunken wheat, weighing respectively 57 and 44 lbs. per bushel, was studied. During the 112 days of the test 2 pigs fed the heavier wheat made an average daily gain of 2.3 lbs. per head, as compared with 2 lbs. on the lighter wheat, the grain required per pound of gain in the 2 cases being 3.8 and 4.2 lbs., respectively. Rating pork at 4 cts. per pound, the heavier wheat was calculated to have a value of 63 cts. per bushel and the lighter 57 cts. Analyses of the 2 sorts of wheat are reported.

Grain rations for dry-lot hog feeding, E. B. FORBES (*Missouri Sta. Bul. 65, pp. 29–92*).—Various questions connected with pig feeding are considered, special interest attaching to the discussions of the importance of palatability, the adaptability of digestive secretions, stimulation of the digestive organs, and related questions not commonly considered in animal feeding though of recognized importance in human nutrition.

The object of the tests reported was to compare linseed meal, wheat middlings or ship stuff, wheat bran, and oats in different proportions, bone meal, and gluten feed as supplements to corn, and to learn the relative merits of soaked corn, corn meal, corn-and-cob meal, and whole corn for dry-lot pig feeding.

The tests were made with 19 lots of 5 to 10 pigs each and covered periods of 60 to 90 days, Nos. 1 to 12 being made in the spring, Nos. 13 to 17 in midsummer, and Nos. 18 and 19 in the autumn. In the tests made in the spring, which were carried on under uniform conditions, the greatest gain, 1.48 lbs. per head per day, was made on a ration of corn meal and linseed-oil meal 5:1, and the smallest gain, 0.32 lb. per head per day, on corn-and-cob meal.

In the tests made in the summer and autumn the average daily gain ranged from 1.133 lbs. per head on corn meal and wheat middlings 4:1 to 1.624 lbs. per head on

and fattens them on rather less food, but does not produce quite so good a carcass of pork." With milch cows gluten feed "did not give quite such good results as an equal weight of decorticated cotton-seed meal similarly fed."

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As pointed out by the author, pasturage for brood sows during the growing season is generally regarded as very desirable and the value of June grass and rape for this purpose was tested with 5 dry sows. No supplementary feed of any sort was supplied. Some of the animals gained a little and others lost, but on an average there was an increase of 2 lbs. in weight.

Tankage and other by-products for pigs. Shrunken wheat for swine, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 90, pp. 12*).—Using 7 lots of 6 pigs each the relative feeding value of tankage, blood meal, linseed meal, ground flax, and skim milk, fed in addition to ground barley and one-fourth acre rape pasturage, were tested in comparison with a ration of barley alone.

During the whole test, which covered 84 days, the average gain on barley was 102 lbs., 5.77 lbs. of feed being required per pound of gain at a cost of 3.91 cts. On the other rations the gain ranged from 109 lbs. on barley and rape to 151 lbs. on barley, skim milk, and rape. The greatest range in the cost of a pound of gain, 3.92 cts. to 4.51 cts., was also noted with these 2 lots. The smallest amount of feed per pound of gain, 4.62 lbs., was noted with the lot fed oil meal, and the largest quantity, 15.34 lbs., with the lot fed barley and skim milk.

In discussing the feeding value of rape attention is called to the fact that the lot on barley and rape gained 46 lbs. more than the lot fed barley only, the amount of grain consumed being practically the same in the 2 cases.

During the past season a considerable amount of wheat in the northwestern United States was more or less damaged by rust and its value lessened for milling purposes. The feeding value of 2 lots of this shrunken wheat, weighing respectively 57 and 44 lbs. per bushel, was studied. During the 112 days of the test 2 pigs fed the heavier wheat made an average daily gain of 2.3 lbs. per head, as compared with 2 lbs. on the lighter wheat, the grain required per pound of gain in the 2 cases being 3.8 and 4.2 lbs., respectively. Rating pork at 4 cts. per pound, the heavier wheat was calculated to have a value of 63 cts. per bushel and the lighter 57 cts. Analyses of the 2 sorts of wheat are reported.

Grain rations for dry-lot hog feeding, E. B. FORBES (*Missouri Sta. Bul. 65, pp. 29-92*).—Various questions connected with pig feeding are considered, special interest attaching to the discussions of the importance of palatability, the adaptability of digestive secretions, stimulation of the digestive organs, and related questions not commonly considered in animal feeding though of recognized importance in human nutrition.

The object of the tests reported was to compare linseed meal, wheat middlings or ship stuff, wheat bran, and oats in different proportions, bone meal, and gluten feed as supplements to corn, and to learn the relative merits of soaked corn, corn meal, corn-and-cob meal, and whole corn for dry-lot pig feeding.

The tests were made with 19 lots of 5 to 10 pigs each and covered periods of 60 to 90 days, Nos. 1 to 12 being made in the spring, Nos. 13 to 17 in midsummer, and Nos. 18 and 19 in the autumn. In the tests made in the spring, which were carried on under uniform conditions, the greatest gain, 1.48 lbs. per head per day, was made on a ration of corn meal and linseed-oil meal 5:1, and the smallest gain, 0.32 lb. per head per day, on corn-and-cob meal.

In the tests made in the summer and autumn the average daily gain ranged from 1.133 lbs. per head on corn meal and wheat middlings 4:1 to 1.624 lbs. per head on

corn meal and linseed-oil meal 5:1. The gain on corn meal, linseed-oil meal, and gluten feed 10:1:1 was also large, being 1.574 lbs. per head per day. In the case of all the lots the grain eaten per pound of gain ranged from 3.77 lbs. with lot 1 on corn meal and linseed-oil meal, 5:1 to 9.45 lbs. with lot 8 on corn-and-cob meal.

When the animals were sold and slaughtered data were recorded regarding the loss in weight in dressing; the weight of head, leaf, and facings; price received, etc. With the lots fed in the spring the dressed weight ranged from 76.5 per cent of the live weight with lot 7 fed corn meal and wheat bran, 4:1 to 84.3 per cent with lot 10 fed soaked whole corn. With the lots fed in the summer and autumn it averaged about 82 per cent. The principal conclusions follow:

"The nutritive ratio alone does not determine the economy with which the nutrients will be used. A ration which is poor in protein, but is palatable, digestible, and concentrated may be greatly more efficient and profitable than a balanced ration not possessing these characteristics. Palatability may in a measure compensate for a lack of protein.

"Hogs fed on corn and linseed-oil meal ate more feed, made greater increase in weight, with a smaller amount both of food and of digestible nutriment and at less expense than with any other grain ration tested in these dry-lot feeding experiments [the balanced ration of corn and oil meal being the most efficient and profitable of the rations tested]. The quality of the pork produced was unsurpassed and the tendency of these feeds to make real growth, as well as fat, was greater than that of any other ration tested. One pound of oil meal replaced from 3.85 to 7.1 pounds of corn, according as it was fed with five or twenty pounds of corn.

"Bone meal fed with whole corn effected a marked saving in the grain requirements per pound of gain. Oats were not as satisfactory as other supplements used.

"All of the supplements used with corn except oats reduced the grain requirements per pound of gain to a smaller amount than that required of corn alone. . . . The advantages of the supplemented rations over those of corn alone increase with the cost of feeds.

"The higher grains are in cost the greater is the profit from the use of supplements with corn, though oil-meal, middlings, and bran were well worth the cost for dry-lot feeding, even when corn was as low in value as thirty cents per bushel; that is, the supplements do not double in cost as corn doubles in selling price.

"Poorly fattened corn-fed hogs dressed higher percentages of carcass to live weight than much fatter hogs which had been fed on more nearly balanced rations. Unduly bulky foods lower the profit for both the farmer and packer; the hog that returns the greatest profit to the farmer is the one that eats the greatest amount of digestible nutriment; the hog that returns the greatest profit to the packer is the one that eats the smallest amount of the most concentrated ration.

"Milk, or grass, or water mixed with the feed, tend to produce a shrinky hog; so does indigestible substances like the fiber of bran and corn cob.

"The packer can afford to pay more for a hog that has had a concentrated grain ration during finishing than for a hog that has had bulkier rations from whatever cause.

"Summer feeding in the dry lot in Missouri appears to cost much more for each pound of increase than dry-lot feeding in spring or fall."

Conversion of waste, W. H. CLARKE (*Agr. Gaz. New South Wales, 15 (1904), No. 10, pp. 953–962, figs. 25*).—The system of pig feeding at a large charitable institution where a herd of about 300 animals are fed the kitchen and table waste is described. The industry is regarded under the conditions as profitable. Brief statements are also made concerning the institution dairy.

The enzym content of the mucous membrane of the pig's stomach and its changes during digestion, F. BENGEN and G. HAANE (*Arch. Physiol. [Pflüger], 106 (1905), No. 6–7, pp. 267–285*).—According to the investigations reported, the

glands of the cardiac region of the pig's stomach secrete an amylolytic ferment, but do not secrete peptic, milk-coagulating, lactic-acid, invertin, or tryptic enzyms.

In the fundus region very active peptic ferment is secured, as well as a strong amylolytic ferment, a milk-coagulating ferment, and a weak fat-cleaving ferment. In the pylorus region the peptic, amylolytic, and milk-coagulating ferments are also found, the peptic and amylolytic ferments being less active or present in smaller quantity than in the fundus secretion. Variations in the amounts of ferments secreted in different stages of digestion and other questions are also considered.

Changes in acid and enzym content of the pig's stomach, F. Bengen and G. Haane (*Arch. Physiol. [Pflüger], 106 (1905), No. 6-7, pp. 286-312, dgm. 1*).—Continuing the work noted above, the authors studied the character of the ferments secreted by the pig's stomach.

Sorghum hay for horses, O. Erf (*Breeder's Gaz., 47 (1905), No. 5, p. 214*).—The feeding value of sorghum hay is briefly spoken of, and its successful use for feeding horses and dairy cows at the Kansas Experiment Station is noted.

Report of poultry division, D. D. Hyde (*New Zealand Dept. Agr. Rpt. 1904, pp. 113-128*).—The work of the poultry expert of the department is summarized, data being given regarding the poultry breeding stations and breeding stock, imports and exports of poultry, storage of eggs, and an egg-laying contest.

Day-old chickens, E. Brown (*Jour. Bd. Agr. [London], 11 (1905), No. 10, pp. 590-594*).—The author points out that the sale of newly hatched chickens is a growing industry. Methods of packing, handling, shipping, and related topics are spoken of.

Preservation of eggs in cold storage, F. Haxton (*Reliable Poultry Jour., 11 (1905), No. 11, pp. 1096-1098, figs. 4*).—The commercial importance of preserving eggs by cold storage is spoken of, and the value of this method from a business standpoint discussed.

DAIRY FARMING—DAIRYING.

Milk investigations at Garforth, 1904, C. Crowther (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 296-349*).—In previous investigations at Garforth (E. S. R., 15, p. 999), the attempt was made to find some method of overcoming the difference in the yield and composition of milk where the intervals between milkings were unequal.

The experiments were continued during 1904, the object being to determine the effect of substituting decorticated cotton cake for corn meal and feeding the entire amount of grain at the morning feeding. The experiments were made with 14 cows and covered 4 periods lasting in all from June 7 to September 9. It is not believed that the substitution of decorticated cotton cake for corn meal increased, to any great extent, either the quantity of milk produced or the percentages of fat and solids-not-fat. Other conditions being equal, it is thought that the quality of the morning's milk is somewhat improved when the grain is all given in the morning.

Contrary to the conclusion previously reached, it is believed that the effects of changes in the nature of the food and the mode of feeding are most pronounced immediately after the change and diminish rapidly in intensity. On the whole it is considered as definitely established that under the conditions prevailing at Garforth during the summer it is impossible to effect any marked improvement in the quality of the morning's milk by such simple changes in the character of the grain ration and the method of feeding as have been investigated in these experiments.

The average fat content of the morning's milk during the entire experiment was 2.96 per cent and of the evening's milk 4.12 per cent; the solids-not-fat were respectively, 8.93 and 8.83 per cent. On 50 out of the 95 days of the experiment the fat content of the morning's milk was below the standard of 3 per cent of fat. The weekly average was invariably below 3 per cent from the beginning of the experiment until the end of August. The solids-not-fat fell below the standard of 8.5 per

cent on only 2 occasions and these were both in the evening's milk. It is believed that the poor quality of the morning's milk is due almost entirely to the inequality in the intervals between milkings and that the prospects of effecting any improvement by means of special feeds or methods of feeding is very slight.

Studies of the effect of weather conditions upon the quality of milk which are in progress will be the subject of a later report.

Investigations on the influence of irritating substances upon milk secretion, M. Popp (*Molk. Ztg., 19 (1905), No. 11, pp. 253, 254*).—This is a review of investigations by G. Fingerling (E. S. R., 15, p. 605; 16, p. 696) in which the influence of such substances as hay extract, fennel, fenugreek, and malt sprouts on the milk secretion of sheep and goats was studied.

Under certain circumstances it is believed that the yield and quality of milk are easily influenced by the use of such substances. Feeding stuffs deprived of their natural qualities through the influence of dry weather are noted as an illustration. With normal feeding stuffs the addition of irritating substances is unnecessary. Very little difference is observed among several of the materials used; fenugreek, however, had no influence.

On the formed elements of colostrum, their origin and significance, R. Popper (*Arch. Physiol. [Pflüger], 105 (1904), No. 11–12, pp. 573–613*).—The characteristic colostrum bodies are considered by the author as cast off secretory cells of the mammary gland which for the most part have undergone fatty degeneration.

Two kinds are recognized, depending upon the amount of fat which they contain. The appearance of the nucleus is believed to be the strongest argument as to the origin of these bodies from glandular cells. The chromatin network is essentially different from that of the leucocytes, but like that of the glandular cells. No neutrophilic granules were found in the colostrum bodies, neither are the bodies believed to arise from other forms of leucocytes than the neutrophilic. Other points of resemblance than the nucleus between the colostrum bodies and the epithelial cells of the gland are noted.

A bibliography is appended to the article.

The significance of the synthesis, phagocytosis, secretion, and degeneration of fat in the formation of milk and colostrum, J. Arnold (*München. Med. Wchnschr., 52 (1905), No. 18, pp. 841–843*).—This is a discussion of the physiology of milk secretion, based in part upon histological studies by the author.

The milking trials of 1904, W. Ashcroft (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 88–117*).—Two-day tests of 71 cows are reported in detail. The average data for the different breeds are added to the summary of records previously reported and quoted (E. S. R., 16, p. 594).

The average yield of milk and the percentages of fat and solids-not-fat for the tests in 1904 were as follows: Shorthorns 43.8 lbs. of milk, 4.01 per cent of fat, and 8.89 per cent of solids-not-fat; Jerseys 35.0 lbs. of milk, 5.17 per cent of fat, and 9.23 per cent of solids-not-fat; Guernseys 32.1 lbs. of milk, 4.53 per cent of fat, and 9.12 per cent of solids-not-fat; Red Polls 37.8 lbs. of milk, 4.10 per cent of fat, and 8.85 per cent of solids-not-fat; Kerries 33.1 lbs. of milk, 4.26 per cent of fat, and 9.17 per cent of solids-not-fat; and Crosses 53.4 lbs. of milk, 4.26 per cent of fat, and 8.94 per cent of solids-not-fat.

Milk records, J. Speir (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 17 (1905), pp. 182–212*).—Tests of 389 cows belonging to 12 herds and tested in cooperation with the Ayrshire Agricultural Association during 1904 are reported in detail.

The records cover a period of 30 weeks. The average production of the 38 best cows during that period was 643 gal. of milk having an average fat content of 3.80 per cent; the average production of 38 cows having the lowest records was 396 gal. of milk with an average fat content of 3.48 per cent.

As in the preceding report (E. S. R., 15, p. 1000), the cows were classified as small, medium, and large. During 30 weeks the small cows averaged 582 gal. of milk, the medium sized cows 628 gal., and the large cows 659 gal. When the cows were grouped according to age, it was found that the average increase in yield of milk per year was 29 gal. from the second to the eighth years inclusive. The maximum yield was given by cows 13 years old, but as the number of cows was small it is considered unreliable. The results obtained indicate that the decrease in the fat content of the milk is not likely to exceed 0.05 per cent per year of age.

Data are also given showing the fat content of the milk at different stages of the lactation period. The fat content was highest during the first week and lowest during the fourth week, after which a gradual increase was observed. The average fat content of the milk of 27 cows during the period of heat was 3.55 per cent, which was equal to that of the whole herd; several, however, gave milk with an abnormally low percentage of fat.

Record of herd tests (*Bien. Rpt. Minnesota State Dairy and Food Comr., 10 (1905), pp. 78–102, pls. 13*).—It is stated that statistics compiled by the State Dairy and Food Commission show that the average cow in Minnesota produces only 166 lbs. of butter annually.

Believing that this average could be raised to a marked extent by the systematic weeding out of poor cows, 12 months' tests of a large number of herds, including in all about 200 cows, were undertaken. Records of 12 herds are reported in this article, along with illustrations of many of the animals. The primary object sought was to furnish convincing proof that every dairyman should test his cows in order to be able to eliminate the unprofitable animals.

A great dairy test at the World's Fair at St. Louis, J. Long (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 28–40*).—The records obtained at the Louisiana Purchase Exposition in the 120-day tests of different breeds are reported and briefly discussed. The author believes that the test is probably the most important one that has ever occurred in the history of agriculture.

Stable inspection (*Bien. Rpt. Minnesota State Dairy and Food Comr., 10 (1905), pp. 109–141*).—The results of the inspection of the stables of herds supplying milk to the cities of St. Paul, Minneapolis, and Duluth are here reported in tabular form.

Progress of dairy farming and dairying (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 133–160*).—This contains considerable information on the condition of the dairy industry in Great Britain.

The subjects discussed include the control of the milk supply; variations in the composition of milk; points for cheese making; adulteration of dairy products; preservation of milk; the milk supply of towns; construction of stables; effect of weather on the quality of milk, and the consumption of milk in the United Kingdom. Mention has already been made of some of the work upon which the summary is based (E. S. R., 16, pp. 592, 817, 818).

The influence of cooperation on dairying, R. A. Anderson (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 48–58*).—Information is given as to the influence of cooperation in developing the dairy industry in Ireland. It is stated that at the present time there are 367 cooperative creameries in Ireland having 46,299 members and producing 14,000 tons of butter per season.

Some features of dairy farming in Denmark, W. Bruce (*Trans. Highland and Agr. Soc., Scotland, 5. ser., 17 (1905), pp. 228–239, figs. 3*).—Notes are given on breeds of cattle, breeding, dairy management, feeding, and the Danish system of control.

Milk testing and control in Denmark, *Jour. Bd. Agr.* [*London*], *12 (1905), No. 1, pp. 21–28*).—This is a brief description of the control societies existing in Denmark and elsewhere for the purpose of enabling farmers to ascertain the productive capacities of their cows.

Progress in the chemistry, hygiene, and bacteriology of milk and its products, WEIGMANN, HÖFT, and GRUBER (*Chem. Ztg., 29 (1905), No. 30, pp. 408–411*).—This is a review of the literature of this subject in 1904.

Milk, A. BERNSTEIN (*Die Milch. Berlin: Julius Springer, 1904, pp. 99*).—As the subtitle indicates, this is a popular discussion of the properties, constituents, and testing of milk; milk supplies of cities; and milk as food. Special attention is given to milk in its relation to public health. Butter making and cheese making are also briefly discussed.

Analyses of Chicago market milk, E. O. JORDAN ET AL. (*Chicago: Health and Sanitation Committee of the Civic Federation of Chicago, 1904, pp. 19*).—This is a report on the results of chemical and bacteriological analyses of 291 samples of milk, representing daily purchases in the open market of Chicago from April 11 to June 9, 1904.

Of the total number of samples 26.8 per cent were below the legal standard of 3 per cent of fat, and 30.9 per cent below the legal standard of 12 per cent of solids. The fat content varied from 0.7 to 10.8 and the solids from 9.52 to 19.5 per cent. The averages were, respectively, 3.37 and 12.41 per cent. Of the 291 samples 4.8 per cent contained formalin.

The average number of bacteria per cubic centimeter exceeded 9,000,000 in April, 10,000,000 in May, and 18,000,000 in June. The range in the different samples was from 10,000 to 74,000,000 per cubic centimeter. Only 1.4 per cent of the total number of samples showed less than 50,000 bacteria per cubic centimeter.

Fluctuations in the composition of milk, F. J. LLOYD (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 7–14*).—The causes of variations in the composition of cows' milk are discussed. Several theories are advanced by the author to explain some of these variations. As an illustration it may be noted that the author believes that the system of tethering cattle practiced in Jersey with the consequent freedom from excitement has caused the milk of these cows to be so exceptionally rich in fat as compared with other solids.

Viscosity of milk, E. CAVAZZANI (*Zentbl. Physiol., 18 (1905), No. 26, pp. 841–845*).—Determinations by means of von Köhler's viscometer were made of the viscosity of the milk of cows and goats and also of human milk. The time required for the emptying of the viscometer at 37° C. when filled with water as compared with the time required when filled with milk, varied in the case of the milk of 7 cows from 1:1.67 to 1:2.03, and with the milk of 3 goats from 1:2.01 to 1:2.15. In 15 samples of human milk the ratio varied from 1:1.41 to 1:2.56. Only preliminary results are here reported.

Specific heat of milk, C. SCHNORF (*Rev. Gén. Lait, 4 (1905), No. 14, pp. 313–315*).—By means of a Bunsen calorimeter, determinations were made of the specific heat of milk coming from a number of dairies in Paris. The minimum, maximum, and average results obtained were, respectively, 1.004, 1.085, and 1.042. This is considered of interest in refrigeration inasmuch as it shows that 1.042 times the quantity of ice is required for freezing milk that is required for freezing water.

A new constituent of milk, BISCARO and BELLONI (*Ann. Soc. Chim., 1905, No. 1, p. 18; abs. in Rev. Gén. Lait, 4 (1905), No. 14, pp. 332, 333*).—In the manufacture of milk sugar delicate crystals are sometimes observed upon the large crystals of sugar. The authors have identified such crystals as a potash salt of an organic acid, and have prepared sufficient material for an elementary analysis.

The potash salt is believed to exist normally in milk. About 60 gm. was obtained from 200,000 kg. of whey, but this was not believed to represent the total quantity present. The new constituent is designated potassium orotate. According to the elementary analysis the orotic acid would have the formula $C_5H_3N_2O_4$. The acid is insoluble or only slightly soluble in ordinary solvents. It decomposes by heat at 260°. By oxidation with potassium permanganate urea is formed.

The predominance of potash in milk in comparison with other liquids of animal origin is believed to be related to the affinity of potash with the new acid.

Observations on the cryoscopy of human milk, L. BARTHE (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 7, pp. 860, 861*).—Determinations were made of the freezing point of the milk of healthy women and of women suffering with influenza, syphilis, and tuberculosis.

Contrary to the results obtained by Guiraud and Lasserre (E. S. R., 16, p. 702), the author did not find that the freezing point of the milk of diseased subjects was sensibly lower than that of the freezing point of normal milk. It is believed that the application of cryoscopy as a means of determining the health of the subject from which the milk was obtained should be accepted with a good deal of reservation. Complete analyses were made of the different samples of milk, and it was found that the freezing point was independent of the composition of the milk.

Composition of the milk of the camel, L. BARTHE (*Jour. Pharm. et Chim., 6. ser., 21 (1905), No. 8, pp. 386–388*).—The milk of the camel is said to be distinguished by its remarkable whiteness, the butter being absolutely uncolored. The proteids are coagulated very readily by acetic acid. Analyses of 2 samples made by the author with 5 analyses previously reported shows the following average composition: Total solids 12.40; fat 5.38; lactose 3.26; casein 2.98; and ash 0.7 per cent.

Milk hygiene investigations, KOLLE ET AL. (*Klin. Jahrb., 13 (1904); abs. in Fortschr. Vet. Hyg., 2 (1905), No. 12, p. 322*).—Heating at 60° C. for 10 minutes was found sufficient to destroy typhoid and paratyphoid bacilli, *Bacillus enteritidis*, and the bacillus of dysentery which had been added to milk.

Fresh milk obtained under aseptic precautions was not found to possess bactericidal properties against coli, typhoid, paratyphoid, and some other species of bacteria. The development of the bacillus of dysentery, on the contrary, was retarded and cholera vibrios were in part killed, yet in no instance did a complete destruction of the organisms occur. The addition of formaldehyde in the proportion of 1:40,000 or 1:25,000 retarded the development of bacteria and delayed the curdling of the milk.

The acidity of such milk is believed to be no indication of the bacterial content, inasmuch as formaldehyde exerts an elective action on lactic-acid forms, while not retarding the development of peptonizing species. No species of pathogenic bacteria, however, was destroyed by the formaldehyde. The preservation of milk for infants with formaldehyde is, therefore, not considered desirable, especially as a sure protection from pathogenic organisms may be secured by pasteurization.

On the influence of certain aldehydes, especially formaldehyde, on the oxidizing ferments in milk and gum arabic, E. SELIGMANN (*Ztschr. Hyg. u. Infectionskrank., 50 (1905), No. 1, pp. 97–122*).—According to the author, 3 oxidizing ferments may tentatively be recognized as occurring in milk:

(1) Superoxydase, corresponding to the catalase of Loew, which decomposes hydrogen peroxid and may be precipitated with the casein by means of acid and salts in contradistinction to oxydase; (2) traces of a direct oxydase, or one not requiring the presence of hydrogen peroxid to produce a reaction; and (3) indirect oxydases, corresponding to the peroxydase of Linnossier and which are active only in the presence of hydrogen peroxid. The isolation of milk bacteria capable of decomposing hydrogen peroxid is noted.

The author studied the influence of formaldehyde and other aldehydes upon these 3 kinds of enzyms and also the effect of formalin upon the keeping qualities of milk. Some of the conclusions reached as regards the influence of formalin upon the enzyms in milk may be stated as follows:

The power of milk to decompose hydrogen peroxid is increased by the addition of formalin. Formalin increases the power of milk to give various color reactions for enzyms. While this property of milk decreases rapidly with age it remains unchanged in milk treated with formalin, which is attributed in part at least to the

lessened formation of lactic acid in such milk. Raw milk loses its power of reaction by heating, while milk treated with formalin is only slightly changed in this respect. Boiled milk showing no reaction is again rendered active by the addition of formalin. The reducing power of raw milk for alcoholic solutions of methylene blue is sensibly decreased by the addition of formalin.

The influence of formalin upon the enzyms of milk was much more marked than that of the other aldehydes and aldehyde-like bodies studied, which included acetaldehyde, propylaldehyde, butylaldehyde, benzaldehyde, furfurol, tetramethyldiamidobenzophenone, and formic acid.

Chloroform and thymol showed no influence on the enzym reactions. Toluol intensified the reactions for enzyms in raw milk, but not to the extent of formalin, neither was it as effective as formalin in preserving enzym reactions against the effects of heating.

The oxydases of gum arabic and milk showed marked differences, the former being more resistant to heat and less sensitive to the effects of lactic acid.

Data are reported on the changes taking place in milk treated with formalin in the proportion of 1:5,000 and kept at room temperatures or in a refrigerator at 8 to 10° C. Control samples curdled on the second or third day, while those preserved with formalin showed at that time no increase in acidity. Somewhat different results were obtained with ordinary milk, milk obtained under aseptic precautions, and pasteurized milk. Formalin was found to exert an elective action in preventing the development of lactic-acid bacteria in comparison with other forms. It is also noted that formalin produces changes of a purely chemical nature in milk.

To determine if proteids suffer changes by the addition of formalin to milk biological tests were made with rabbits. The precipitins obtained reacted with preserved and raw milk in the same manner and at the same dilution, failing to show, therefore, any effect of the formalin.

The results of the investigations are believed by the author to be of practical importance in hygiene in two respects. Various tests hitherto used for distinguishing raw and cooked milk are believed to lose their significance, since formalin can restore the reaction lost by heating. As a common idiosyncrasy against milk has been attributed to the milk enzyms, it is considered possible that formalin may increase this idiosyncrasy, since it increases the activity of the enzyms and may, therefore, in this way influence unfavorably the especially sensitive digestive process in infants.

A bibliography is appended.

The milk of tuberculous cows, Moussu (*Rev. Soc. Sci. Hyg. Aliment., 1 (1904), No. 7, pp. 817–824, pls. 2*).—Of 57 samples of milk from cows reacting to the tuberculin test but showing no clinical symptoms of tuberculosis, 7 samples showed the presence of tubercle bacilli, as determined by inoculation experiments with guinea pigs. The author, therefore, concludes that the milk of all cows reacting to the tuberculin test should be rejected.

On the distribution of Bacillus enteritidis of Gaertner in cows' milk, E. Klein (*Centbl. Bakt. u. Par., 1. Abt., Orig., 38 (1905), No. 4, pp. 392, 393*).—Of 39 samples of milk coming from different farms 10 samples produced a chronic disease of the spleen in guinea pigs as a result of subcutaneous or intraperitoneal injections.

From the miliary nodules in the spleen a bacillus was isolated which, in cultural characteristics and in inoculation experiments, behaved in all respects like *Bacillus enteritidis*. The micro-organisms were believed to be present in the original samples in only very small numbers inasmuch as no fatal results followed inoculation. Pure cultures of the organism, however, caused the death of guinea pigs and mice in 5 days. The source of the micro-organism in the milk was not ascertained. It is believed that in summer when such milk has been allowed to stand for some time and used in a raw condition bad results might follow.

Biological investigations on the pasteurization of milk, A. HIPPIUS (*Jahrb. Kinderheilk., 61 (1905), No. 2, pp. 365–384*).—A specific precipitin was produced in the blood of rabbits by the repeated injection of raw, pasteurized, and heated cows' milk. This was true even when the milk was heated at 120° C. for 1 hour.

Raw cows' milk was found to exert a strong bactericidal influence on *Bacillus coli communis* and *B. prodigiosus*. This influence was most marked during the first 3 to 4 hours and then gradually decreased, disappearing at the end of 6 to 7 hours. The bactericidal properties were weakened by pasteurization at 65° for ½ hour. Pasteurization at 85° for 2 minutes likewise reduced the bactericidal power. Boiled milk showed no trace of bactericidal action.

The oxidizing ferment in cows' milk was destroyed by heating at 76° for a short period. It was not only uninjured by pasteurization at from 60 to 65°, but showed a stronger reaction when the pasteurization at this temperature was continued for 1 hour.

The fat-splitting ferment in human milk remained unchanged by heating at 62° for a short period, at 63° it was weakened, and at 64° destroyed. It resisted a temperature of 60° for 1 hour.

The so-called salol-splitting ferment in human milk was weakened by heating at 55° for a short period and completely destroyed by temperatures above 65°.

The proteolytic ferment of cows' milk was found to retain its digestive action in both weak alkaline and acid media by pasteurization at 60° for 1 hour and 65° for ½ hour. It was destroyed by heating at 100° for a short period.

The amylolytic ferment of human milk was not destroyed by pasteurization at 60° for 1 hour or 65° for ½ hour, but was destroyed by heating above 75°.

The author therefore recommends pasteurization at 60 to 62° for 1 hour, or 63 to 65° for ½ hour, which, as well as the customary method of pasteurizing at 85° for 1 to 2 minutes, is considered sufficient to destroy all pathogenic bacteria, and not to produce any important changes in the chemical composition of the milk nor to destroy the most important biological properties. Experiments in the feeding of infants with pasteurized milk were not successfully terminated.

Immunization by means of milk, B. SALGE (*Jahrb. Kinderheilk., 61 (1905), No. 3, pp. 486–499; abs. in Biochem. Centbl., 3 (1905), No. 22, p. 723*).—Milch goats were immunized against diphtheria and typhoid and their milk fed to infants. Blood examinations of such infants failed to show any increase in the content of antibodies. The author does not believe that the passage of antitoxic or bactericidal substances from the milk of animals to infants as the result of feeding has been established.

Investigation of pasteurized milk, A. A. BONNEMA (*Chem. Ztg., 29 (1905), No. 14, pp. 182, 183*).—The author recommends the pasteurization of milk at 65° C. for 15 minutes and describes his method of detecting pasteurized milk. Samples of the milk are incubated at 37° when in case the pasteurization is well done only butyric acid and gas-producing bacteria develop, while in case the pasteurization is not efficient lactic-acid bacteria develop and gas production is absent.

Pasteurization of skim milk, W. W. P. McCONNELL (*Bien. Rpt. Minnesota State Dairy and Food Comr., 10 (1905), pp. 55–57, figs. 2*).—Apparatus suitable for pasteurizing skim milk in creameries is illustrated and described.

The rôle of some physical and chemical agents in rendering the phosphates of milk insoluble, P. DIFFLOTH (*Abs. in Rev. Gén. Lait, 4 (1905), No. 13, pp. 308–310*).—A study of the effect of such conditions as may occur in practice upon the solubility of phosphates in the milk is reported.

For the purpose of this work the phosphates in milk were classed as insoluble calcium phosphates, soluble calcium phosphates, and organic phosphorus compounds. The object of the study was to determine the proportion of each of these forms of phosphoric acid and the modifications brought about by conditions met with in the

transportation and keeping of milk. In milk 2 hours old the total phosphoric acid was 4.58 gm. per liter, of which 41.92 per cent was soluble, 46.28 per cent organic, and 11.8 per cent insoluble. The insoluble phosphoric acid in fresh milk is believed to be due to the action of carbon dioxid during milking.

Examinations of milk 2, 24, and 48 hours after milking showed a decrease in the amount of organic phosphorus and an increase in the insoluble phosphoric acid. The greatest increase in insoluble phosphoric acid was made soon after milking, while the decomposition of lecithin was progressive. Heat was much more effective than standing in increasing the amount of insoluble phosphoric acid. The duration of the heating exerted a greater influence than the elevation of temperature. Heating at 60° C. for 30 minutes caused a loss of 25.9 per cent of the assimilable phosphoric acid; heating at 95° for 60 minutes a loss of 48.7 per cent; and at 110° for 30 minutes a loss of 54.2 per cent.

The farmers' creamery in Missouri, R. M. WASHBURN (*Missouri Sta. Circ. of Information 18, pp. 21, figs. 2, dgms. 5*).—This circular contains information regarding the building and equipment of small creameries and cheese factories. Articles of agreement and by-laws suitable for a creamery association are included.

A simple alkali test for ripeness of cream, H. E. VAN NORMAN (*Indiana Sta. Bul. 104, pp. 267–274, figs. 2*).—The test as used at the station is described. A 1/50 normal sodium hydroxid solution is prepared by diluting 30 cc. of a normal solution to 1,850 cc. By means of a Babcock pipette 17.6 cc. of cream or milk is measured into a white cup, a few drops of phenolphthalein solution are added, and the alkaline solution is poured in from a graduate until a pink reaction is obtained. One cubic centimeter of the alkaline solution corresponds to 0.01 per cent of acid.

Notes are given on the degree of acidity desirable at churning and on grading cream. A table of equivalents is also given showing readings by Mann's acid test, Farrington's alkaline tablets, and the method used at the Indiana Station.

Water content and Reichert-Meissl number of butter from different sources, H. THEODOR (*Chem. Ztg., 29 (1905), No. 23, p. 309*).—Determinations of the water content and Reichert-Meissl number of 107 samples of butter from Holland, France, Denmark, Siberia, Argentina, Germany, Russia, Canada, Australia, and New Zealand are reported without comment.

The butter tests of 1904, W. C. BROWN (*Jour. British Dairy Farmers' Assoc., 19 (1905), pp. 118–128*).—Tests of 44 cows at the dairy show of the British Dairy Farmers' Association in 1904 are reported. The report is similar to that of previous years (E. S. R., 16, p. 598).

Abnormal butter and milk analyses, O. VON SPINDLER (*Chem. Ztg., 29 (1905), No. 7, p. 78*).—Samples of butter showing Reichert-Meissl numbers as low as 25 and samples of milk containing over 6 per cent of fat and over 15 per cent of total solids from Savoy were believed to be unadulterated. Analyses of 46 samples of butter and milk are reported.

Whey butter, E. H. FARRINGTON (*Hoard's Dairyman, 36 (1905), No. 11, p. 311*).—It is stated that the whey from Swiss cheese often tests as high as 1 per cent of fat. Objections to the old process of skimming, in which the whey is allowed to stand until the fat rises, are as follows: The excessive loss in skimming; the poor quality of butter made from the whey; the contamination of the patrons' cans by returning sour whey in them; the inferior feeding value of the sour whey, and the public nuisance that these sour whey tanks are to the community in which they are located.

Experiments at the station have demonstrated that all these objections may be overcome by running the sweet whey through a cream separator. The butter made from the fat from whey was found in practical tests to be indistinguishable from creamery butter. It is estimated that in a Swiss cheese factory receiving 4,000 lbs. of milk per day a gain of at least $5 may be made by substituting the new method for the old.

The proteids of butter in relation to mottled butter, L. L. VAN SLYKE and E. B. HART (*New York State Sta. Bul. 263, pp. 69–93, pl. 1*).—The authors' summary of this bulletin is as follows:

"The questions studied in this bulletin are: (1) The relation of casein compounds to cream-ripening; (2) casein compounds present in butter and buttermilk; (3) the relation of casein compounds to mottled butter.

"In ordinary methods of cream ripening, neither calcium casein nor free casein is present, but only casein lactate, when the lactic acid is allowed to exceed 0.5 per cent. Casein lactate is the substance most familiar as curdled sour milk.

"When the amount of lactic aid in cream exceeds 0.5 per cent the casein in the butter and buttermilk is present as casein lactate. In butter and buttermilk made from so-called sweet cream, we usually find calcium casein and some free casein, and on standing for some weeks these may be changed in the butter into a mixture of free casein and casein lactate or wholly into casein lactate.

"It has been quite universally believed that the light spots or streaks in butter known as mottles, are caused by the uneven distribution of salt, the more concentrated brine deepening the yellow color of the fat, and the lighter portions being the unsalted or lightly salted areas.

"The investigation covered the following conditions in relation to the mottling of butter: (1) Richness of cream; (2) degree of ripeness of cream; (3) temperature of churning; (4) size of butter granules; (5) temperature of wash water; (6) working of butter.

"When the churning was managed so as to make the butter granules of the size of rice grains and these were carefully washed twice with water below 45° F., removing most of the buttermilk adhering to the outer surface of the granules, no mottles were obtained, however conditions were varied in other respects. Mottles were always found when the buttermilk was not sufficiently removed.

"The amount of proteid (casein lactate) in mottled butter is greater in the light portions than in the darker portions, and is the cause of the lighter color of the mottles.

"Salt brine does not change in any way the color of butter fat; salt brine, as it commonly occurs in butter, has the power of hardening and localizing the proteid particles, the action requiring several hours for completion; butter, free from buttermilk adhering to the outer surface of the granules, does not produce mottles when salted, whether the salt is evenly or unevenly distributed; mottles do not occur in unsalted butter; in mottled butter the light portions usually contain less salt than the darker portions.

"Mottles in butter are due, primarily, to the presence and uneven distribution of buttermilk adhering to the outer surface of the small granules; and, secondarily, to the hardening and localizing effect of salt brine upon the proteid of the buttermilk thus retained in butter. The light portions of mottled butter owe their lighter color to the presence of localized proteid (usually casein lactate). The yellow or clear portions occur where the spaces between the butter granules are filled with clear brine and are comparatively free from casein compounds. Several hours are required to complete the action of the brine upon the proteid of the butter.

"Mottles in butter can be prevented by avoiding those conditions that retain buttermilk in the butter and observing those conditions that favor the removal of buttermilk from butter granules before salting. The butter granules should be about the size of rice grains and should be washed twice with water at a temperature of 35 to 45° F."

The causes and prevention of mottles in butter, F. H. HALL, L. L. VAN SLYKE, and E. B. HART (*New York State Sta. Bul. 263, popular ed., pp. 10, fig. 1*).—A popular edition of Bulletin 263 of this station noted above.

On the preparation of cheese from sterilized egg albumen, A. RODELLA (*Centbl. Bakt. u. Par., 2. Abt., 14 (1905), No. 9–10, pp. 297–302*).—The recently reported investigations of von Freudenreich and Thöni (E. S. R., 16, p. 917), which are critically reviewed, are believed to show nothing so far as the anaerobic bacteria are concerned.

In opposition to the views of these authors Rodella considers anaerobic bacteria essential in cheese ripening. In the experiments here reported sterile egg albumen was inoculated with anaerobic bacteria isolated from cheese and also with *Bacterium lactis acidi*. Control cultures were inoculated with the lactic-acid bacteria alone. After 4 weeks the fluid from one of the mixed cultures which had accidentally become contaminated with molds resembled in taste Gorgonzola and another Italian cheese. The albumen was no longer white, but of a yellowish color, and showed many small cavities.

Other cultures not contaminated with molds were kept at 20° C. for 2 months, when a distinct ripening was considered apparent. There was no unpleasant odor and the taste was very agreeable, suggesting that of fresh Limburger cheese. In the control cultures no ripening was recognized, which is considered as a proof that in these experiments at least the anaerobic bacteria were essential to the cheese-ripening process. No practical importance as regards the manufacture of cheese from egg albumen is attached to the experiments.

On the influence of bacteria in the cheese industry, E. KAYSER (*Indus. Lait. [Paris], 30 (1905), No. 17, pp. 198–201*).—This is a discussion on the nature and causes of the changes taking place in cheese during the process of ripening.

Outlook of the milk-powder industry, C. KNOCH (*Molk. Ztg., 19 (1905), No. 12, pp. 281–283*).—It is believed that a milk powder in which the proteids exist in their natural condition is not yet to be found on the market. The preservation of the proteids in their natural condition is considered an absolutely essential requisite of a milk powder.

It is believed that a whole-milk powder answering all requirements can be introduced into commerce only with difficulty, even if the danger that the powder may become rancid is obviated. A skim-milk powder answering all requirements promises, however, to be able to serve as a substitute for whole milk for cooking purposes, but it is not thought that skim milk can be generally utilized in this way in dairies.

VETERINARY SCIENCE AND PRACTICE.

Some problems in the life history of pathogenic micro-organisms, T. SMITH (*Science, n. ser., 20 (1904), No. 520, pp. 817–832*).—The author presents a general discussion of the biological relations of the pathogenic bacteria with reference to the modern theories which have been adopted for explaining their action. The mutual relation of micro-organisms and their hosts is discussed in great detail.

In this connection the author proposed a hypothesis for explaining the general phenomena of infection. It is assumed that the tendency of all invading bacteria in developing a more highly parasitic state is to act on the defensive while securing an opportunity for greater multiplication and escape to a new host. This hypothesis is based on the fact that the production of diffusible toxins persists indefinitely after the cessation of parasitism and, further, on the fact that where toxin-producing bacteria have become adapted to different species, the toxin itself acts upon a considerable number of species. No strictly invading bacteria have been found capable of producing diffusible toxins that are of any significance in the disease process.

The lesions caused by invasive bacteria are due to the disintegration of the bacteria and the consequent setting free of the poisons contained in the bacterial bodies. It appears probable in a certain number of species of bacteria that a latent stage follows the vegetation stage and during this period the parasite provides itself with a pro-

tective envelope which aids it in its passage to the new host. The formation of protective coverings, the strengthening of the cell wall, and the secretion of defensive fluids will account for the well-known phenomena in bacteria better than the current theory according to which parasitism is based exclusively on the production of toxin.

According to the nature of the diseases produced by different micro-organisms, these bacteria may be divided into 3 groups in the first of which are placed bacteria which live upon the skin and mucous membranes and gain entrance to the body only through lesions; the second group appear only occasionally and produce epidemics, while the third group are best adapted for parasitic life and produce diseases of a fixed type. The organisms of diphtheria and pneumonia belong to the first group, those of Asiatic cholera and bubonic plague to the second group, and tuberculosis, leprosy, glanders, and the eruptive diseases to the third group.

Progress in bacteriology, BUSCH and G. MARPMANN (*Ztschr. Angew. Mikros., 10 (1904), No. 8, pp. 197–207*).—Attention is called to the great importance in modern bacteriology of the relationship between pathogenic bacteria and host. The biology of these bacteria is briefly discussed with notes on the chemical substances produced by their action.

The effect of filtration on bacteriolytic complements, EDNA STEINHARDT (*Jour. Med. Research, 12 (1904), No. 4, pp. 479–489*).—The chief purpose of the investigations reported in this paper was to determine the effect on the bacteriolytic complement of passing serum through a Berkefeld filter. The author also attempted to devise a method for separating the bacteriolytic complement from the immune body at a temperature of 0° C., and also to differentiate different bacteriolytic complements by filtration.

In these experiments it was found that horse serum when passed through a Berkefeld filter of the smallest size and finest quality lost the bacteriolytic complement until the filter became saturated by absorption, after which the complement passed through without apparent loss. It was found possible to separate the bacteriolytic complement from the immune body at a temperature of 0° C., but the method is attended by so many technical difficulties as to render the results obtained rather uncertain.

The differentiation of bacteriolytic complements by filtration is, in the author's opinion, to be explained by their quantitative differences in the original serum rather than by a difference in the size of molecules or a difference in the adhesiveness of the molecules of several complements.

The influence of artificial interference with metabolism upon the production of alexins, P. T. MÜLLER (*Arch. Hyg., 51 (1904), No. 4, pp. 365–421*).—In the course of most infectious diseases during which a crisis occurs it has been observed that the favorable or unfavorable turn which may take place at this time is influenced in a large degree by the relative amount of alexins produced by the affected animal.

With this fact in mind, the author undertook a number of experiments for the purpose of testing the influence of artificial changes in metabolism upon the course of infection. Pigeons were subjected to a period of fasting and then inoculated with a number of pathogenic organisms including the bacilli of typhoid, dysentery, *Bacillus proteus*, etc. The withholding of food from pigeons was found to influence the production of agglutinins in a striking manner. This influence differed, however, in the case of different micro-organisms. After infection with certain species of bacteria the quantity of agglutinins was increased, while in other cases it was diminished.

A test was also made of the influence of the kind of nutrition upon the course of infectious diseases. Pigeons were used in these experiments and were inoculated with *Bacillus pyocyaneus* or *B. proteus*. Some of the pigeons were fed with milk, wheat bread, and potatoes, while others received no milk. The kind of nutriment received appeared to have no influence upon the immunization of the pigeons toward

B. proteus. In the case of *B. pyocyaneus*, however, the influence of the food was very marked. In the pigeons fed on milk the average amount of agglutinins produced was about 7 times as much as in those fed on potatoes.

Experiments were also undertaken to determine the effect of alcohol upon rabbits inoculated with typhoid bacilli. In these tests it was found that the control animals produced about 4 times as much agglutinin as the rabbits which received alcohol. The author also tested the effect of sodium cinnamate or hetol upon rabbits after inoculation with typhoid bacilli. The increase in the production of alexins after treatment with hetol was very pronounced, and this fact is considered of some importance in the treatment of infectious diseases of animals and man.

The agglutination of red blood corpuscles by chemical precipitates and the suspension of these precipitates in colloidal media, O. GENGOU (*Ann. Inst. Pasteur, 18 (1904), No. 11, pp. 678–700*).—The literature relating to this subject is briefly discussed. During the extensive series of experiments carried out by the author it was found that certain chemical precipitates agglutinated and later destroyed the washed red blood corpuscles. This agglutination is due to the direct action of the precipitates upon the corpuscles. The blood serum, even in small doses, hinders agglutination and hemolysis.

Natural and conferred resistance to disease in the animal body, F. C. LEWIS (*Vet. Jour., 59 (1904), No. 354, pp. 315–323*).—A general discussion is presented on the subject of immunity, together with a special account on active immunity, passive immunity, antibacterial serum, and Grünbaum's serum reaction.

Friedberger and Fröhner's veterinary pathology, trans. by M. H. HAYES (*London: Hurst and Blackett, Ltd., 1904, vol. 1, XII+519*).—This is a translation from the fourth German edition with numerous additions by the translator on surra, South African horse sickness, Texas fever, louping ill, etc. The volume contains a special discussion of the most important infectious diseases of animals as well as of chronic constitutional diseases, and notes on bacteriology.

Pathological observations, G. PETIT (*Rec. Méd. Vét., 81 (1904), No. 21, pp. 673–682, figs. 2*).—Notes are presented on a variety of pathological processes including icterus, pneumonia in dogs, and lymphangitis and anasarca in horses.

Annual reports of proceedings under the diseases of animals acts, A. C. COPE and A. W. ANSTRUTHER (*London: Bd. Agr. and Fisheries, 1904, pp. 94, pls. 2*).—A general account is presented of the effective work which has already been done in eradicating and preventing further introduction of such diseases as cattle plague, pleuro-pneumonia, foot-and-mouth disease, rabies, etc. No case of rabies has been noted in Great Britain since 1902.

Glanders among horses is on the increase and the same statement is made for anthrax. The great distribution of anthrax is believed to be due in part to infection through food and drinking water. No outbreak of foot-and-mouth disease occurred among native animals in Great Britain during 1903. A detailed account is given of the present status of hog cholera and sheep scab and the relative changes in the distribution of these diseases are indicated on special maps.

The veterinary section, A. THEILER (*Transvaal Agr. Jour., 3 (1904), No. 9, pp. 49–98, pl. 1*).—A report is made on investigations relating to African coast fever.

A test was made to determine the length of time during which an infection persists in a given area. With regard to this point the South African conference of veterinary surgeons adopted a resolution to the effect that the only certain method of eradicating African coast fever is to kill off all cattle in infected areas and to keep cattle away from such areas for a period of not less than 18 months. The methods of vaccination proposed by Koch were tested on a large scale and it was found that little hope can be entertained of permanent good results from these methods.

Dipping and spraying experiments were also tried, during which arsenical dips were used with or without other additions. Arsenical dips repeated at frequent

intervals were found to injure the skin to a considerable extent and did not prevent infection. When izal was added to such dips their efficiency was in no way increased. The average incubation period for dipped cattle was 16 days and for control animals 17 days. Dipping is therefore not considered as capable of materially assisting and controlling the disease.

A report is also made on inoculation experiments against African coast fever by C. E. Gray (pp. 58–60). Notes are given on diseases caused by trypanosomes and the transmission of African coast fever by ticks, on dietetic diseases of pigs, etc. It is concluded that African coast fever in South Africa is transmitted by *Rhipicephalus appendiculatus* and *R. simus*.

The etiology and etiological treatment of tetanus, E. VON BEHRING (*Beitr. Expt. Ther., 1904, No. 7, pp. 1–72*).—The author presents a detailed account of his technical methods for obtaining tetanus toxin and for estimating its virulence.

It has been found that the relative amount of antitoxin required for the neutralization of tetanus toxin in vitro decreases with the increase in the quantity of toxin. This fact is considered striking when it is remembered that the exact reverse is true for diphtheria. The author believes that nothing is added to or taken from the toxin molecules when they become attenuated. They merely suffer a diminution in the rapidity of their reaction without material change. It was found possible to immunize rabbits most successfully by means of attenuated tetanus toxin.

Several methods for increasing the immunizing action of the tetanus toxin have been devised, but the most successful methods involved the extraction of the toxin from the central nervous system. The immunizing power of tetanus toxin appears to be determined by several factors, chiefly, however, by any influence which may favor or hinder the penetration or absorption of the toxin by the nervous system. The chemical processes of the formation of the toxins persists until the affinities of the nerve cells are completely satisfied.

It was found possible to demonstrate by experiments on animals that the time element is as important in the antitoxic treatment of tetanus as in a case of diphtheria in man.

The use of serum in the prevention of tetanus, E. THIERRY (*Jour. Agr. Prat., n. ser., 8 (1904), No. 45, p. 611*).—Brief notes are presented on the use of an antitetanus serum in the form of a powder. The results obtained from the use of this serum have been quite satisfactory and brief notes are given on the methods which should be adopted in using it so as to obtain the best results.

Races of tubercle bacilli, P. H. RÖMER (*Beitr. Expt. Ther., 1903, No. 6, pp. 1–110, pls. 11*).—The behavior on various nutrient media and the pathogenic power of various races of tubercle bacilli are described in detail. At the University of Marburg these cultures of different origin have been maintained for varying periods, some of them for a long time, and had been used in experiments relating to the various phases of tuberculosis.

The oldest culture which is described was obtained from a case of human tuberculosis. It produces the disease with the usual symptoms in all experimental animals, including cattle, but does not cause in cattle the formation of a permanent focus of infection. The most satisfactory place for inoculating cattle is in the anterior eye chamber. Guinea pigs were found to be most susceptible to this race of tubercle bacilli, and in this regard they were followed by horses, goats, sheep, and cattle. The susceptibility of sheep and goats was increased by previous treatment with tuberculin.

The author describes a second race of tubercle bacilli which was derived from the first one by a passage through goats. This race, like the first, was tested on various animals. Different cultures were found to vary considerably in their virulence. The second race of tubercle bacilli showed a comparatively high virulence, which is attributed to its passage through goats.

A third race of tubercle bacilli was obtained from Professor Arloing and had been rendered homogeneous according to his method. This culture was also tested on mice, guinea pigs, rabbits, goats, horses, and cattle and was found to differ in a pronounced manner from other tubercle cultures of human origin. It was the least virulent of all tubercle bacilli obtained from man. In rabbits and horses it produced slight symptoms of pneumonia, but when used in small doses the inoculated animals soon recovered.

Detailed notes are also given on cultures obtained from cattle and on the results of inoculation experiments with these cultures. Considerable difference in virulence was obtained between different cultures, but as a rule guinea pigs were killed within 4 to 8 days by intraperitoneal inoculation with bovine tubercle bacilli. The lesions produced in guinea pigs from certain bovine cultures were very similar to those caused by tubercle bacilli from birds.

Numerous experiments were made with tubercle bacilli obtained from birds, and during these experiments quite striking differences in virulence were observed, as in the case of tubercle bacilli obtained from man and animals. Cultures obtained from birds were characterized by their high virulence toward experimental animals, especially toward cattle. In guinea pigs phenomena of intoxication were sometimes pronounced, while the formation of tubercles was less striking. The power of producing true tubercles in guinea pigs was greatly accentuated by the passage of the avian tubercle bacilli through mammals.

The intermediary body of the tubercle bacillus, Dembinski (*Compt. Rend. Soc. Biol.* [*Paris*], *57* (*1904*), *No. 34, pp. 502–504*).—The author studied the behavior of the intermediary body in the serum of rabbits and pigeons inoculated with tubercle bacilli of human and avian origin.

The injection of human tubercle bacilli into rabbits or pigeons did not cause the formation of the intermediary body, but a similar injection of avian tubercle bacilli, on the contrary, brought about the appearance of this body. The production of the intermediary body therefore appears to depend, not upon the greater or less resistance of the animal toward tubercle bacilli, but upon the race of tubercle bacilli used in the experiments.

The intermediary body exhibits a similar action toward tubercle bacilli, whether living or dead and whether of human or avian origin. The injection of experimental animals with dead human or avian tubercle bacilli does not cause the production of the intermediary body in the blood.

The histogenesis of the tubercle, J. Miller (*Jour. Path. and Bact.*, *10* (*1904*), *No. 1, pp. 1–49, pls. 4*).—The observations reported in this paper were chiefly confined to a study of the development of tubercles in the liver of rabbits. The anatomy of this organ is carefully described with reference to its relationship to the progress of tuberculosis.

The liver was inoculated by injecting tubercle bacilli into a branch of the mesenteric vein. The microscopic changes produced in the liver of rabbits as the result of the infection of human tubercle bacilli were described in great detail. It appears that the tubercle bacillus causes the formation of the tubercle partly as a result of irritation like that produced by other foreign bodies and partly as the result of the presence of a specific toxin which causes caseation in the surrounding tissue. The tubercle bacillus is distinguished from most related organisms by its exceedingly slow development.

The aggregation of cells which constitutes the tubercle is considered to be due to a process of phagocytosis. Giant cells, epithelioid cells, and lymphocytes are believed to be simply stages in the development of a phagocyte. The mononuclear cells of the blood play an important rôle during the whole process of formation of the tubercle. In the early stages of the process giant cells result from a fusion of several

epithelioid cells. Frequently a typical tubercle may arise without the occurrence of mitotic division in the fixed cells of the affected tissue.

After a certain period the tubercles acquire a peculiar friability, so that they are easily broken up and burst into by the blood vessels and their constituents pass into the blood stream. The endothelial cells of the liver are found to be destroyers of the polynuclear leucocytes when these occur in large numbers.

The extent of transmission of tuberculosis to man by means of the meat of tuberculous cattle, M. WESTENHOEFFER (*Ueber die Grenzen der Uebertragbarkeit der Tuberculose durch Fleisch tuberculöser Rinder auf den Menschen. Berlin: August Hirschwald, 1904, pp. 48*).—The literature relating to this subject is critically reviewed. The purpose of the author's investigations was to determine by means of experiments the extent to which the meat of tuberculous cattle contains tubercle bacilli which are of sufficient virulence to transmit the disease.

A brief account is presented of the negative and positive results obtained by different investigators during their experiments along this line. The author came to the conclusion after a study of this subject that the only satisfactory method of determining the virulence of tubercle bacilli in meat was that of hypodermic or intraperitoneal inoculation. During the author's experiments the meat of six cattle was used and the experimental animals were guinea pigs and rabbits. The results obtained by the author are not in harmony with the assertion of Koch that the meat as well as the milk of tuberculous cattle contains numerous virulent tubercle bacilli.

It was found by the anthor that the meat, even of cattle affected with general tuberculosis to such an extent that they must be entirely excluded from the market, contained either no tubercle bacilli at all or not enough to produce tuberculosis when inoculated subcutaneously into animals which are most susceptible to the disease. On the other hand, the meat of one animal which was affected with acute miliary tuberculosis contained so many tubercle bacilli that 59 per cent of the experimental animals inoculated with this material became tuberculous.

Notes are given on the methods of procedure which have been adopted in various localities with regard to the treatment of the meat of tuberculous cattle from the standpoint of a scientific system of meat inspection.

The meat inspection law with reference to tuberculosis, M. WESTENHOEFFER (*Berlin. Klin. Wchnschr., 41 (1904), Nos. 45, pp. 1165–1169; 46, pp. 1196–1202*).—As a result of the critical study of the workings and effect of the German imperial meat inspection law with especial reference to tuberculosis, the author comes to the conclusion that all meat brought into cities which are furnished with public abattoirs should be subjected to a second inspection. It is also recommended that the head, thoracic viscera, spleen, and kidneys be submitted with the rest of the body in their natural connection.

In cities with public abattoirs it is urged that slaughtering for private purposes outside of these abattoirs should not be permitted. Only graduated veterinarians should be appointed as directors of abattoirs.

New data on the control of bovine tuberculosis, P. H. RÖMER (*Beitr. Expt. Ther., 1904, No. 7, pp. 73–109, pls. 33*).—An account is presented of the fate of various animals treated by the immunization method used by von Behring and the author. Notes are also given on the new experiments along the same line which have been completed or are still in progress at the University of Marburg.

The results obtained by other authors in testing the same method of immunization are also briefly reported. A detailed scheme is presented covering all points to be observed in making protective inoculations for the purpose of immunizing cattle against tuberculosis in agricultural practice. In general, only animals which are apparently healthy and from 3 weeks to 4 months of age should be selected for the first vaccination. Exceptionally, older cattle may be vaccinated provided they are

in perfect health. The purity and strength of the vaccine is determined in the Hygienic Institute of the University of Marburg, and is offered for sale through a commercial firm in the city of Marburg.

All persons who receive quantities of the vaccine obligate themselves to give a detailed report concerning the results obtained with it. Thus far over 1,000 cattle have been vaccinated outside of the Hygienic Institute of the University of Marburg, and this number in addition to those which have been kept at the university have furnished data which are believed to demonstrate that the principal underlying the vaccination method used by the author is well founded. No more experiments, therefore, seem to the author to be required to demonstrate the possibility of protecting cattle by this means of vaccination, but many minor points regarding the use of the method in ordinary practice still remain to be determined.

Animals which have been immunized by this method may be subsequently exposed to natural infection without any reserve or without giving attention to the possible presence of tubercle bacilli in their quarters.

Chronic tympanites in cases of bovine tuberculosis, J. Hamoir (*Ann. Méd. Vét., 53 (1904), No. 12, pp. 657–672*).—The symptom of tympanites is considered as almost characteristic of chronic tuberculosis in cattle. It has frequently been attributed to swelling and hypertrophy of the mesenteric and other lymphatic glands.

The author believes, however, that this can not be considered as the only cause of tympanites in such cases. The paralysis of the rumen due to compression of the esophagus must be considered an important factor in the process. Attention is called to the fact that cases of tympanites of unknown origin quite frequently occur and must not be confused with those due to tuberculosis.

Experimental tuberculosis in the endocardium, L. Bernard and M. Salomon (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 30, pp. 359–361*).—The author found that it was possible to produce tuberculosis of the endocardium in rabbits by inoculation with tubercle bacilli in the arterial system and without introducing organisms into the valves and other structures of the heart.

In these experiments it was found that the tuberculous nodules occurred in large numbers between the fibers of the myocardium and consisted of epithelioid and giant cells. Nodules were also found under the pericardium consisting of lymphocytes and epithelioid cells. Experiments carried out by the authors seemed to demonstrate that a tuberculous infection of the heart may take place as a result of the presence of tubercle bacilli in the blood.

Antituberculous serum therapy by means of the serum of vaccinated animals, Rappin and Blaizot (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 33, pp. 448, 449*).—Von Behring's experiments in vaccinating cattle against tuberculosis were repeated by the authors with success. An attempt was made to utilize the blood of a vaccinated heifer in the treatment of experimental tuberculosis in guinea pigs. No beneficial effect was observed, however, by the use of this serum and it was concluded, therefore, that the serum of vaccinated animals is not necessarily active toward tubercle bacilli of human origin.

Contagious abortion in cows, A. E. Moore (*Amer. Vet. Rev., 28 (1904), No. 8, pp. 743–747*).—This disease is defined and notes are given on its symptoms and course. There appears to be no natural immunity to abortion. The most successful treatment consists in the use of carbolic acid, creolin, and other disinfectants.

Milk fever and other calving troubles, J. R. Weir (*Jour. Dept. Agr. Victoria, 2 (1904), No. 10, pp. 991–998*).—The symptoms and course of milk fever are briefly discussed, together with notes on its etiology. In treating this disease the author recommends the Schmidt treatment. Various general directions were also given regarding the care of cows with especial reference to preventing the development of milk fever. A similar discussion is also given of the cause, symptoms, diagnosis, and treatment of metritis and debility.

A case of parenchymatous mammitis in the cow, H. TAYLOR (*Vet. Jour., 59 (1904), No. 354, pp. 323, 324*).—In the case reported by the author, milk secretion ceased entirely and general symptoms of serious constitutional disturbances were manifested. After various lines of treatment had been adopted, including the complete removal of the side of the udder which was worst affected, recovery took place.

Pasteur's method of vaccination against anthrax in Rome, U. E. FERRETTI (*Gior. R. Soc. Accad. Vet. Ital., 53 (1904), No. 47, pp. 1105–1112*).—Pasteur's method of vaccination for the control of anthrax has been thoroughly tested in one section of the city of Rome. The operation extended from July 11 to August 1, this time being required for giving 2 vaccinations with the proper interval. The method was found to be exceedingly inexpensive and quite effective when combined with careful destruction of all carcasses of animals dead of anthrax.

Treatment of malignant catarrhal fever with physiological salt solution, SCHOTTE (*Berlin. Tierärztl. Wchnschr., 1904, No. 48, pp. 787, 788*).—The author tested a number of remedies including colloidal silver in the treatment of this disease without any success. In general, therefore, the slaughter of affected animals was recommended.

Finally an experiment was made with the method proposed by Péricaud, according to which physiological salt solution was administered hypodermically. The author tried this method on a case of malignant catarrhal fever which showed the typical symptoms of the disease in a pronounced manner. A subcutaneous injection was given of 9 gm. of common salt in 1,500 cc. of sterilized water at a blood temperature. The injection was repeated by the owner during the 2 following days and a complete recovery took place.

On account of the rapid improvement and the absence of the other treatment the author ascribes this cure entirely to the use of physiological salt solution.

Dysentery in calves, T. KITT (*Wchnschr. Tierheilk. u. Viehzucht, 48 (1904), No. 49, pp. 773–778*).—The symptoms and etiology of this disease are briefly discussed. The author has carried on a number of experiments for the purpose of determining whether immunity toward this disease can be brought about by intravenous inoculation of dead cultures of the bacilli of swine plague, hog cholera, swine erysipelas, contagious coryza, etc. In combating the disease the application of the serum treatment recommended by Jensen is very effective and may be combined with the feeding of milk treated with formalin and the isolation of new-born calves.

Azoturia, R. PRICE (*Amer. Vet. Rev., 28 (1904), No. 7, pp. 648–657*).—The author describes in detail the symptoms and course of this disease with especial reference to their bearing upon its etiology. The cause of the disease, however, still remains doubtful. One of the most active agents in producing the chemical changes which are characteristic of azoturia is found, according to the author, in bile acids. The introduction of these substances into healthy animals produces symptoms which are similar to spontaneous cases of azoturia.

Mercurialis annua the cause of serious hemoglobinuria, T. MICUCCI (*Gior. R. Soc. Accad. Vet. Ital., 53 (1904), No. 48, pp. 1129–1131*).—This plant, which belongs to the spurge family, occurs abundantly on cultivated soil. When eaten by cows it sometimes causes serious hemoglobinuria. An examination of the kidneys in such cases showed that the epithelial cells were somewhat affected. The milk appeared to be unaltered.

The gid parasite (Cœnurus cerebralis): Its presence in American sheep, B. H. RANSOM (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 66, pp. 23, figs. 12*).—The gid parasite was discovered in sheep near Bozeman, Montana, in 1904. This is believed to be the first authentic record of the parasite in American sheep.

A brief account is given of the life history of this worm, together with detailed descriptions of the parasite in its various stages. Sheep over 2 years old are not so susceptible as younger animals. The symptoms of gid are described in cases in which

infestation has occurred in the brain and also in the spinal cord. The pathological lesions are also described.

No treatment of gid is successful. In preventing the distribution of the worms it is desirable to kill all useless dogs and also wolves and foxes. Dogs which are kept for herding purposes or other use about the farm should be treated at intervals for the adult form of the tape worm. In this way the general distribution of the worm should be prevented.

A sheep parasite, W. W. Froggatt (*Agr. Gaz. New South Wales, 15 (1904), No. 10, p. 977*).—Considerable loss was experienced in sheep and wool in parts of New South Wales on account of the attack of the sheep maggot belonging to the genus Caliphora. Carbolic washes of various sorts have been tried and abandoned, since they have no lasting effect. Sulphur and oil is an effective remedy, and arsenic may be added to this mixture in cases where there are no wounds on the skin.

The sheep nostril fly (*Bd. Agr. and Fisheries [London], Leaflet 118, pp. 4, figs. 2*).—The habits and life history of *Œstrus ovis* are described and notes are given on the symptoms of infestation of sheep with these insects and on the most successful methods of treatment for ridding sheep of them. The fly may be prevented from laying its eggs in the nostrils of sheep by repeated treatment with tar, fish oil, or similar substances. Sheep should be removed from pastures which are known to be infested before the season for the appearance of the adult flies.

Sulphur internally as a preventive against the attacks of ticks, W. Robertson (*Agr. Jour. Cape Good Hope, 25 (1904), No. 5, pp. 588–590, figs. 3*).—It has been sometimes supposed that the internal use of sulphur was effective in preventing the infestation of cattle with ticks. The author, therefore, tested this matter in a thorough manner.

Two young steers and a colt were given sulphur in their food for a period of about 40 days, during which they received about 1½ oz. of sulphur daily. At the end of this period the daily dose was increased to about 3 oz. The steers were then infested with *Rhipicephalus decoloratus*. These ticks reached maturity in the usual time, and it was thus shown that the prolonged sulphur treatment did not produce the slightest effects upon the ticks.

Similar results were obtained after infestation of the colt. Animals were fed with doses of aloes and wild garlic, but neither of these acted as preventives or caused the ticks to fall off from infested animals.

Trypanosome diseases, R. Koch (*Deut. Med. Wchnschr., 30 (1904), No. 47, pp. 1705–1711, figs. 5*).—The biology and life history of trypanosomes are briefly discussed with especial reference to their pathogenic effects in the production of various diseases of animals and man. Among these diseases special mention is made of surra, mal de caderas, tsetse-fly disease, the trypanosomiasis of rats, and similar diseases in man. These diseases are classified by the author under 2 groups, in the first of which the trypanosomiasis of rats and the trypanosome disease of cattle as described by Theiler are placed.

Trypanosomiasis in the Anglo-Egyptian Soudan, A. Balfour (*British Med. Jour., 1904, No. 2291, pp. 1455, 1456*).—Attention is called to the discovery of the trypanosomes in the blood of cattle which came from Kodok. In one animal which died of the disease and in the blood of which the trypanosomes were found a pigmented ulceration of the membrane of the stomach was observed. Large numbers of ticks were found on this animal and were believed to belong to *Amblyomma variegatum*. In the northern Soudan, trypanosomiasis has thus far not been shown to prevail. The author examined the blood of bats, small birds, and mammals with negative results.

Note on the rôle of the horsefly in the transmission of trypanosoma infection, L. Rogers (*British Med. Jour., 1904, No. 2291, pp. 1454, 1455*).—The author calls attention to the fact that in 1899 he carried out a series of experiments in Muk-

tesar, India, during which it was shown that horseflies were instrumental in transmitting surra. This fact was demonstrated by transmitting the disease through a series of dogs which were allowed to be bitten by infected horseflies. Brief notes are given on various species of insects which may be concerned in transmitting trypanosomes.

Equine glanders and its eradication, C. F. DAWSON (*Florida Sta. Bul. 77, pp. 241–283, figs. 5*).—The author presents a general account of the history of glanders, its pathogenic micro-organism, occurrence, transmission, pathogenesis, symptoms of acute and chronic forms, and diagnosis. A discussion is also presented of outbreaks of glanders which have occurred in Florida since September, 1903.

Some of the cases of glanders in Florida were apparently due to the importation of a large number of horses into Florida during the Spanish-American war. Notes are given on the distribution of these outbreaks and the means which were adopted in determining the source of infection and in eradicating glanders. The author discusses the general problem of State protection of live-stock interests, together with the various legal aspects of this problem.

A brief digest is presented of State laws relating to the eradication of glanders and indemnity to be paid for affected horses.

Immunity of cattle toward glanders, V. GALTIER and J. NICOLAS (*Jour. Méd. Vét. et Zootech., 55 (1904), Nov., pp. 650–652*).—The author studied the serum of cattle after repeated inoculation with glanders virus. As a result of these experiments it was found that adult cattle which had been subjected to repeated inoculation with glanders bacilli did not produce a serum which exercised any immunizing or curative properties when inoculated into horses infected with glanders or showing a spontaneous case of the disease.

A general eczema in horses, SCHWERDTFEGER (*Ztschr. Veterinärk., 16 (1904), No. 11, pp. 488–492*).—The symptoms and course of this disease are described with reference to other similar cases described in the literature of the subject. In treating the disease-affected horses they were given laxatives, after which the eczematous parts were treated with a 2 per cent solution of bacillol or some other similar disinfectant, such as ichthyol, creolin, etc.

Urticaria, PERKUHN (*Ztschr. Veterinärk., 16 (1904), No. 11, pp. 483, 484*).—A brief clinical history is given of a case of this disease in a horse. A large number of small swellings appeared on the sides of the neck, shoulders, front legs, and other parts of the horse, and the acute outbreak of the disease was accompanied by a pronounced fever and other symptoms.

An infectious disease of horses with alterations of the bones, CHARON and THIROUX (*Compt. Rend. Acad. Sci. [Paris], 139 (1904), No. 19, pp. 752–754*).—In Madagascar a number of horses and mules were observed to be infected with a disease during the course of which the bones became altered in a manner similar to that which occurs in osteomalacia. Detailed notes are given on the symptoms and pathological lesions which appear during this disease. The authors are inclined to the opinion that the disease is identical with osteomalacia and that it may be due in part to the presence of *Piroplasma equi*.

A rapid method for the diagnosis of rabies, V. A. MOORE and C. WAY (*Amer. Vet. Rev., 28 (1904), No. 7, pp. 658–662*).—The methods proposed by Pasteur, Babés, Van Gehuchten, Nelis, Ravenel, and Negri for the diagnosis of rabies are briefly described.

Among these various methods, that proposed by Van Gehuchten and Nelis has given the best results and is considered to be the most satisfactory. Certain changes take place in the plexiform ganglion, and since this ganglion may be dissected out with comparative ease it is a simple matter to diagnose rabies in suspected animals. The changes characteristic of rabies in the plexiform ganglion consist of atrophy, invasion and destruction of the ganglion cell as a result of newly formed cells of

endothelial origin. In advanced cases of the disease nearly all of the nerve cells are destroyed.

Experimental diagnosis of rabies, C. Livon (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 33, pp. 479, 480*).—The results obtained during the author's investigation of this problem indicate that it is always wise to make control inoculations with an emulsion of portions of the central nervous system in sterilized glycerin sometime after the beginning of putrefaction of the nervous tissue. This method, however, may lead to the development of septicemia and on account of the great susceptibility of rabbits to septicemia it is advisable to inoculate a few guinea pigs for purposes of comparison.

Experimental diagnosis of rabies in decomposing nerve centers, C. Nicolle (*Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 30, pp. 349–351*).—While the experimental diagnosis of rabies in living animals is a comparatively simple matter, it is very difficult to diagnose the disease by inoculation with brain matter taken from dead animals in the process of decomposition. In such cases infected animals are likely to die of septicemia, and therefore no diagnosis can be reached.

During the author's experiments it was found that nerve substance in a state of decomposition could be satisfactorily used in making test inoculations provided it was previously treated with glycerin. It appears from these experiments that glycerin has the power of destroying other organisms which may be present in the virus, while it does not affect the rabies organism.

The dog: Hygiene, diseases, J. Pertus (*Le chien: Hygiène, maladies. Paris: J. B. Baillière & Sons, 1905, pp. VIII+388, figs. 80*).—This is a revised edition of the author's treatise on the dog in which particular attention has been given to the pathology of all diseases which affect this animal. The volume contains an account of the external and internal anatomy of dogs, their hygiene, the use of dog meat as human food, reproduction, and all diseases classified according to the organs affected.

AGRICULTURAL ENGINEERING.

Pumping for irrigation, J. J. Vernon, F. E. Lester, and H. C. McLallen (*New Mexico Sta. Bul. 53, pp. 16, figs. 2*).—This bulletin reports tests of the fuel cost of pumping water with a 6 in. centrifugal pump driven by a 22 horsepower gasoline engine with crude oil attachment, the pump being placed in the 6 in. well described in a previous bulletin of the station (E. S. R., 15, p. 195) and the fuels used being crude oil from Beaumont, Texas, kerosene, and gasoline. The results obtained are briefly summarized as follows:

"Crude oil was proven to be the cheapest fuel yet tested at this station, that is, cheaper than wood, coal, kerosene, or gasoline. The cost of a 10 hour run with the above named engine on each kind of oil was as follows: Crude oil \$3.05, kerosene \$6.57, and gasoline \$6.65. Therefore, for a 10 hour run, crude oil cost 53½ per cent less than kerosene and 54 per cent less than gasoline, all being used in the same engine under practically identical conditions.

"The residue from the crude oil was used as a lubricant on ordinary bearings with good effect. The residue also gave good results when used on the streets for laying the dust.

"Rope belting was not satisfactory in these tests.

"Large engines when used for pumping purposes should always be provided with friction-clutch pulleys so that they may be started without load."

The tests are to be continued in order to determine whether difficulties will develop with extended use.

Water and irrigation in the Province of San Luis, Argentine Republic, A. L. Cravetti (*An. Min. Agr. Argentina, Sec. Agr. (Agron.), 1 (1904), No. 5, pp. 85–119, figs. 6*).—This is one chapter of a detailed report on the agricultural conditions of this province summarizing information regarding surface and subterranean waters

of the province, methods employed in the development of the water supply, the use of surface and subterranean water in irrigation, legislation relating to water, systems of irrigation, reservoirs, colmataje (warping), and flooding.

The River Nile and irrigation in Egypt (*Engineering* [*London*], *78* (*1904*), *No. 2023, pp. 476, 477, fig. 1*).—This is a review of a report by Sir William Garstin on conditions on the Upper Nile and on the possibility of increasing and controlling the flow of water by reservoirs, cut-off canals, etc.

The Roosevelt masonry dam, on Salt River, Arizona (*Engin. News, 53* (*1905*), *No. 2, pp. 33–37, figs. 3*).—The location, plan, and specifications for construction of this dam are given.

River discharge, mean velocity, and cross-sectional area curves, F. W. Hanna (*Engin. News, 53* (*1905*), *No. 12, pp. 301, 302*).

Notes on hydrology, and the application of its laws to the problems of hydraulic engineering, D. W. Mead (*Madison, Wis., 1904, pp. 202, ill.*).

Administration of streams in irrigation, E. Mead (*Irrig. Age, 20* (*1905*), *No. 5, pp. 144–146, figs. 3*).—A paper read before the Western Society of Engineers.

First biennial report of the State engineer to the Governor of North Dakota, 1904, E. F. Chandler (*Bien. Rpt. State Engin. N. Dak., 1* (*1904*), *pp. 91, figs. 8*).—The principal features of this report are a discussion of desirable irrigation laws for the State, with a draft of an irrigation code by Morris Bien, descriptions of the river systems of the State and methods of stream measurement, and accounts of surveys made by the U. S. Geological Survey. The text of the national reclamation act and the articles of incorporation of Lower Yellowstone Water Users' Association are also given.

The corn picker and husker (*Farmers' Voice and Rural Outlook, 43* (*1905*), *No. 1, p. 22, figs. 2*).—A brief review of the evolution of this machine and descriptions of construction, and accounts of successful practical tests of two makes.

The disposal of strawboard and oil-well wastes, R. L. Sackett and I. Bowman (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 113, pp. 52, pls. 4, figs. 4*).—This bulletin contains two papers dealing with two particularly troublesome sources of damage to water supplies. The areas in which such damage occurs are very large and important, pollution by strawboard wastes covering the States of Ohio, Indiana, and Illinois, that discussed in the paper on oil wastes occurring in all parts of the country in which oil wells have been developed.

MISCELLANEOUS.

Seventeenth Annual Report of Colorado Station, 1904 (*Colorado Sta. Rpt. 1904, pp. 73–115*).—This report, which is included in the annual report of the State board of agriculture, contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1904; and reports of the director and heads of departments on the different lines of station work during the year.

Annual Report of Idaho Station, 1904 (*Idaho Sta. Rpt. 1904, pp. 39*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1904; and reports of the director and heads of departments. Some of the departmental reports are noted elsewhere.

Seventeenth Annual Report of Kansas Station, 1904 (*Kansas Sta. Rpt. 1904, pp. XXX+253–256*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1904; a report of the council on the publications and work of the different departments of the station during the year; a brief account of the results obtained at the Fort Hays Branch Station; brief statements concerning the progress made in the destruction of prairie dogs and other noxious mammals; and an outline of the experiments in testing and improving cereals being carried out by the station in cooperation with this Department. A complete list of station publications to June 30, 1904, is included.

Annual Report of Virginia Station, 1904 (*Virginia Sta. Rpt. 1904, pp. 27*).—This includes the organization list of the station; a report of the director, giving the changes in the staff of the station and outlining the investigations now in progress; a financial statement for the fiscal year ended June 30, 1904, and departmental reports.

Finances, meteorology, index (*Maine Sta. Bul. 111, pp. 209–226 + XII, pls. 2, figs. 2*).—This bulletin consists of reprints of press bulletins published in 1904; meteorological observations noted elsewhere; a financial statement for the fiscal year ended June 30, 1904; an index to bulletins 100 to 111 of the station, which collectively make up the Twentieth Annual Report of the Station; the organization list of the station; brief statements concerning the station by the director; and a history and description of Holmes Hall. The subjects of the 5 press bulletins are as follows: Retopping sweet apple trees; mulching for apple trees and gooseberries; testing vitality of seeds; oat smut and its prevention; making clover hay.

Second Annual Report of the Wisconsin Agricultural Experiment Association, 1904 (*Ann. Rpt. Wisconsin Agr. Expt. Assoc., 2 (1904), pp. XVIII + 132, pls. 4*).—This contains a report of the meeting held in February, 1904, at which the results of experiments along different lines were reported. Among the subjects of the numerous papers and addresses mention may be made of the following: Official corn score card; Wisconsin grain crops; growing clover for seed; growing barley; farm managers; Wisconsin tobacco; treating seed corn to prevent smut; rape as a forage plant for pigs and sheep; growing alfalfa, soy beans, and Swedish Select oats; and summer pasture for pigs. Outlines for experimental work are also given.

Agricultural returns, 1904 (*Bd. Agr. and Fisheries [London], Agr. Returns 1904, pp. 56*).—This publication contains tables showing the acreage under crops and grass and the number of horses, cattle, sheep, and pigs in each county of Great Britain, with summaries for the United Kingdom.

Agricultural statistics, Ireland, 1904 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Stat. 1904, pp. 43, dgm. 1*).—Tables are given showing the acreage and the produce of the crops for the year 1904.

Report of the government statistician on agricultural and pastoral statistics for 1903 (*Brisbane: Govt. Printer, 1904, pp. 68*).—Among the general agricultural statistics for Queensland the yields, imports, and exports of wheat, barley, corn, oats, rice, potatoes, sweet potatoes, cotton, and tobacco are given.

Agriculture within the empire, edited by W. MACDONALD (*Pretoria: Govt. Printing Office, 1905, pp. XVI + 165 + XI, pls. 50, maps 4*).—A report of the Boer delegates, W. L. Jooste, J. M. Lane, and H. T. Rood, on the agriculture and stock farming of Canada, Australia, and New Zealand. Included in the general discussion of agricultural conditions as observed on the tour are descriptions of the Central Experimental Farm at Ottawa, the Ontario Agricultural College in Canada, and the Bathurst, Wagga-Wagga, and Momohaki farms in Australia, a chapter being devoted to each institution.

Contributions to the information on agriculture in Würtemberg, V. VON STREBEL (*Beiträge zur Kenntnis der württembergischen Landwirtschaft. Plieningen: Friedrich Find, 1904, pp. 77*).—The management of 34 estates is described and the income and expenditures of each are briefly stated. The grain yields of the country are shown in tables and discussed.

Employer and employees in Norwegian agriculture, O. A. R. SANDBERG (*Tidsskr. Norske Landbr., 11 (1904), No. 4, pp. 141–174*).

Description of small prize farms in Sweden, 1902 and 1903 (*Meddel. K. Landtbr. Styr. [Sweden], 1904, Nos. 89, pp. 33; 90, pp. 51*).

The first principles of agriculture and forestry, R. HENDERSON (*London: Country Gentlemen's Assoc., Ltd., 1904, pp. XVI + 408*).—This book discusses the physical and chemical properties of matter, the formation of soils, meteorology, vegetable and animal life, and forestry. A chapter each is devoted to soil fertility, manuring, and breeding live stock.

NOTES.

Alabama College Station.—D. T. Gray, of the University of Illinois, has been appointed assistant in animal industry in the college and station, vice N. C. Rew, resigned. At the recent meeting of the board of trustees provision was made for the continuation of the cooperative work in animal industry with this Department, and also for the holding of a summer school or "round-up" farmers' institute, July 25 to August 2.

Arizona Station.—Henry B. Slade, associate chemist, died suddenly of heart failure June 5. Mr. Slade was probably best known for his discovery of the action of enzyms upon organic compounds in sorghum, with the formation of prussic acid to which the poisonous effect of sorghum under certain conditions is due. His death is a severe loss to the station, where the researches which he had begun during his brief association of eight months gave promise of valuable results. The Territorial legislature has made an appropriation of $20,000 to the university, including the following amounts for the benefit of the experiment station: $1,300 for planting and care of a date orchard at Yuma, $1,500 for printing and binding for the next two years, and $1,500 for the erection of a barn and seed room which the station will have the use of.

Arkansas University and Station.—H. S. Hartzog resigned as president of the college at the close of the college year, and J. M. Tillman was elected to succeed him. C. F. Adams, a graduate of the University of Missouri, has been appointed entomologist to the station, and R. W. Wade, of the Ontario Agricultural College, has been appointed agriculturist.

Florida University and Station.—The board of control recently appointed under a new law to locate the State institutions has selected Gainesville as the future seat of the university. The change from Lake City will not be made for a year. C. F. Dawson, veterinarian, severed his connection with the university and station at the close of the college year.

Purdue University and Station.—C. O. Swanson has been appointed instructor in agricultural chemistry in the college of agriculture and assistant chemist in the station. Fred Rasmussen, a graduate of the Iowa Agricultural College, has been appointed instructor in dairying in the college.

Iowa College and Station.—L. S. Klinck, assistant in farm crops, has resigned to accept a position in the new agricultural college which is being founded by Sir William C. Macdonald, known as the Macdonald Foundation for Rural Education, at Ste. Anne de Bellevue, near Montreal. The board of trustees of the college have decided to confer the degree of bachelor of agricultural engineering on students who complete a prescribed course in this subject. Graduates of either engineering or agricultural courses are eligible after the completion of one year's advanced work. A "good-roads school" held from June 12–17, the first effort of the kind, was very successful.

Kansas College and Station.—J. T. Willard will spend the summer in Europe, where he will make a special study of agricultural experiment station and educational work, visiting typical institutions for that purpose. Professor Willard will also attend the International Congress of Agricultural Education at Liege, Belgium, July 28 and 29.

Louisiana University and Station.—B. C. Pittuck, adjunct professor of agriculture, has resigned. Contracts have been let for rebuilding the farm residence and a library and office building at the North Louisiana Station, Calhoun. These are to replace the buildings lost by fire last fall. The station at Baton Rouge has received a carload of high-grade Hereford cattle from Texas for feeding experiments. They will be carried on pasture during the summer, and the feeding will begin at the approach of cool weather. Some experiments in the use of soiling crops for the production of beef are just being started. R. L. Menville and A. B. Joffrion have been added to the station staff as chemists. Both graduated at the State University in June this year. The director of the stations, W. R. Dodson, has delivered a series of lectures at the various summer normal schools for teachers. Elementary agriculture will be taught in the public schools the coming session, and a good deal of interest in the subject is being manifested by the teachers.

Maine University and Station.—S. N. Spring, of the department of forestry in the university, has resigned to enter the Forest Service of this Department. Miss Bessie G. Leeds, B. S., of Minnesota, has been appointed general assistant to the station. Her duties will be chiefly in connection with the seed and food inspections, and will begin September first.

Michigan College and Station.—The State legislature has removed the limitation to the amount which the college may receive under the one-tenth of a mill tax. Under a former law the amount was limited to $100,000 per year, and the removal of this restriction will increase the annual revenue of the college from this source $57,000 a year on the present valuation.

An appropriation of $55,000 was made to replace Wells Hall, which was destroyed by fire during the winter. The new building will be 3 stories in height and approximately 240 ft. long. It will have dining rooms in the basement, students' rooms on the next two floors, and society rooms above. Twenty thousand dollars was appropriated for the purchase of live stock and additions to the equipment of the animal industry department. At least $2,000 is to be spent for poultry. The campus having been extended to the vicinity of the barns, an appropriation of $10,000 was made to move the latter southward to high ground near the Red Cedar River. The Upper Peninsula Substation received an appropriation of $9,000 for new buildings and additions to equipment.

Andrew J. Patten, assistant chemist at the New York State Station, has been appointed chemist to succeed Floyd W. Robison, who was recently appointed chemist of the State dairy and food commission. The membership of the board of agriculture has been increased to seven, and the upper peninsula of the State is to be represented on the board.

Minnesota Station.—A. C. Parker and A. D. Wilson have been appointed assistants in agriculture in the station.

Missouri Station.—G. I. Reeves, assistant entomologist, has resigned to accept a position in the Bureau of Entomology of this Department. He is succeeded by Cyrus R. Crosby.

Nebraska University and Station.—Samuel Avery, chemist to the station, has been elected to the chair of chemistry in the university. He will retain his connection with the station.

New Hampshire Station.—Albert C. Blaisdell, assistant chemist, has resigned to accept a position with the Solar Refining Company, Lima, Ohio. Edward H. Goodnow has been appointed to the vacancy.

New Jersey Stations.—Louis A. Voorhees, for many years connected with the chemical department of the station, and for several years past chief chemist, has resigned. He is succeeded in that position by John P. Street, formerly associate chemist. G. F. Warren has been appointed horticulturist.

New York State Station.—William E. Tottingham, instructor in chemistry at the

Massachusetts Agricultural College, has been appointed assistant chemist to this station, vice C. W. Mudge, resigned.

Ohio University.—E. S. Guthrie, a graduate of the Iowa Agricultural College, has been appointed assistant professor of dairying.

Oklahoma College and Station.—W. R. Shaw, botanist and entomologist, resigned at the close of the college year and is succeeded by J. F. Nicholson, formerly assistant in bacteriology. W. L. English, B. S., a graduate of the college, has been appointed assistant in animal husbandry in the college and station, vice E. H. Riley, resigned.

Rhode Island College and Station.—The State has granted an appropriation of $500 for repairs to poultry buildings and improvements to the yards; also $20,000 for a greenhouse for college and station purposes, and for a poultry building for the college. Additional appropriations have been made for paying a deficit which has existed for several years in connection with the college, and $4,000 has also been given for a student labor fund and for continuing the work of the agricultural demonstrator.

South Carolina College and Station.—At the June meeting of the board of trustees it was decided to separate the directorship of the station from the presidency of the college, and to make the head of the agricultural department the director. J. S. Newman severed his connection with the station, having resigned a year ago, his resignation to take place at this time. J. N. Harper, formerly connected with the Kentucky College and Station, was elected director of the station and placed in charge of the agricultural department of the college. C. L. Newman, formerly of the Arkansas University and Station, was elected associate professor of agriculture and agriculturist to the station. Arrangements have been made to enable the station men to devote one-half of their time to research work, giving three consecutive days of the week to the station work. The board also appropriated $6,000 for the erection of a greenhouse, to be used in connection with the agricultural department and largely for the purposes of the station. It will be equipped with all modern appliances for high-grade work.

Tennessee University and Station.—Gordon M. Bentley, of the North Carolina Station, has been appointed instructor in zoology in the university and assistant State entomologist. W. E. Grainger has been appointed associate chemist to the station.

Utah College and Station.—P. A. Yoder, associate chemist, has been elected director of the station, vice J. A. Widtsoe, and William Jardine agronomist, vice L. A. Merrill. The legislature at its last session appropriated $39,000 for experimental work under the station, apportioned as follows: For experiments in arid farming, $15,000; irrigation and drainage investigations, in cooperation with this office, $10,000; for a central experimental farm to be devoted to fruit growing, $8,000, and for the maintenance of the branch station in the southern part of the State, $6,000.

Washington College and Station.—W. A. Linklater, who for the past two years has been associated with the correspondence school at Sioux City, Iowa, has been appointed head of the animal husbandry department of the college and station.

Elementary Agriculture in Wisconsin.—The Dunn County School of Agriculture and Domestic Science, Menomonie, Wis., graduated this year a class of 19 boys and girls, 8 of whom completed the regular two-year course and 11 the short course. The commencement address was given by Dean W. A. Henry. The school offers this year for the first time a short summer course, beginning June 21, in which instruction in agriculture, manual training, and domestic economy are the leading features. The purpose of the course is to prepare teachers to meet the requirements of a law passed at the recent session of the State legislature requiring that agriculture be taught in the rural schools.

Agriculture at Cambridge University.—The board of agricultural studies at Cambridge University reports, according to *Nature*, a steady increase both in the number of students attending the agricultural courses and in the number presenting themselves for the examinations. The number of students is now close to 50, an increase of 7

the last year. The honorary degree of M. A. has been conferred by the Cambridge University upon Mr. Robert Stephenson, late chairman of the Cambridgeshire County Council, in recognition of his services to education, and especially to the promotion of agricultural education in the university.

West of Scotland Agricultural College.—At a recent meeting of the governors of the college it was reported that the total number of enrollments in the day and evening classes for the session 1904–5 was 471, as compared with 376 for the previous session. The total number of students enrolled in the winter classes was 189, including 33 in the special farmers' class and 32 who were primarily students in veterinary science. The total number of students attending the dairy school during the session of 1904 was 215. For the junior certificate course 34 students enrolled, 26 of whom obtained junior certificates in dairying, and six the certificate in butter making. For the senior certificate in dairying 32 students enrolled and 21 were successful in passing the examination. Eleven students passed the examination for the national diploma in dairying.

Harper-Adams Agricultural College.—The report presented at the annual meeting of the governors of the college showed an attendance of 75 students during the past year. Six students were successful in passing examinations for the national diploma of agriculture, and two students gained the professional associateship of the Surveyors' Institute. The report showed that about 85 per cent of the former students of the college are now farming or engaged in agricultural pursuits. The extension work done by the college has considerably increased and includes county lectures in veterinary science and horticulture, instruction in practical gardening at some of the secondary schools in the county, and instruction in dairy work at the Technical School for Girls, Shrewsbury. The college farm has been increased, about 55 acres of arable land adjoining the present farm having been acquired on long lease. The college is now recognized by the council of the Surveyors' Institute as a teaching institution.

Midland Agricultural and Dairy Institute.—A special course of instruction in dairying is offered by the Midland Agricultural and Dairy Institute, at Kingston, from August 1 to 27. The course is intended primarily to prepare students, who have attended courses of instruction at some agricultural college, for the examinations conducted by the joint education board of the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland, for their national diploma in dairying. The course is open, however, to persons engaged in teaching dairying. Candidates for admission must produce evidence (1) that they have attended the course of instruction at some recognized agricultural college for at least one session and are well grounded in practical agriculture and general chemistry, or (2) that they are actively engaged in the teaching of dairying. Not more than 20 students will be admitted to the course, the fee for which is £5 (nearly $25).

Agricultural Instruction in Somerset.—The report of the Agricultural Instruction Committee of the Somerset County Council for the first quarter of this year shows that courses of instruction were given in agriculture, poultry keeping, gardening, and nature study; and that the committee has adopted a scheme of experimental work to be conducted throughout the county during the current season, including fertilizer experiments on meadow hay, mangels, swedes, and potatoes. The Bath and West of England Society has signified its willingness to conduct the cheese school for another year, which will be located at Glendale Farm, Wedmore. It is noted that Miss Jessie Stubbs, late of the Horticultural College, Swanley, has been engaged as instructress for the county butter school. The school was formally opened at Shepton Mallet on March 3, and one course of instruction has been completed. A second course is now in progress and there are sufficient applicants for a third course.

Office of Public Roads.—An appropriation of $50,000 for the Office of Public Roads (formerly the Office of Public Road Inquiries) of this Department became available

July 1, an increase of $15,000 over the previous year. This will enable an enlargement of the scope of the work to include the investigation of the chemical and physical character of road materials, which has been carried on in the Bureau of Chemistry, and to furnish expert advice on road making. Director Martin Dodge retired with the close of the year, and was succeeded by Logan W. Page as director. Dr. A. S. Cushman, as assistant director, assumed charge of the laboratory and testing work, with Philip T. Wormeley as engineer of tests. A new Highway Division has been established, with A. N. Johnson as highway engineer in charge of all field work, and a Division of Records for the collection and compilation of statistics relating to road building, under the direction of M. O. Eldridge. A post-graduate course in highway engineering is being offered by the Office, with a view to giving young civil engineers theoretical and practical training in road building. A number of young men entered upon this course at the beginning of the year.

Food Inspection Laboratories of the Bureau of Chemistry.—Laboratories for food inspection under the Bureau of Chemistry of this Department are now in operation in New York and San Francisco, R. E. Doolittle being chief of the New York laboratory and R. A. Gould of the laboratory in San Francisco. New laboratories are being located in Boston, with B. H. Smith in charge; New Orleans, with C. W. Harrison in charge; and Philadelphia and Chicago. The chiefs of the last two have not yet been definitely determined upon.

Government Testing of Agricultural Machinery in Spain.—It is stated in a recent number of *Mark Lane Express* that "according to a report of the Austro-Hungarian consul at Madrid, a royal decree of December 23, 1904, provides for the establishment of a testing station for agricultural machinery at the 'Instituto Agricola de Alfonso XII' (a kind of agricultural high school), at Madrid. The aim is to make practical tests of agricultural machinery and apparatus as regards material, mode of operation, work accomplished, cost, etc. Spanish and foreign inventors, constructors, and agriculturists are invited to submit machinery for this purpose. The station will be provided with the necessary space, power, and attendants. In this way the expense for machine owners will be greatly lessened, and foreign manufacturers, in particular, will be enabled to introduce their goods into Spain. The results of each test will be embodied in an official certificate."

Organ of the German Experiment Stations.—With the close of Volume 61 of *Die Landwirtschaftlichen Versuchs-Stationen*, the organ of the German experiment stations, Prof. F. Nobbe relinquished the editorial supervision which he has retained for over 40 years. The journal was founded in 1859, and Professor Nobbe assumed editorial control in 1861, 56 consecutive volumes having been issued under his direction. This journal has attained a high rank as an organ for agricultural investigation, and is very widely known. The reason given for Professor Nobbe's relinquishing the editorial management is his retirement from active service, as previously announced.

He is succeeded as editor by Dr. O. Kellner, director of the agricultural experiment station of Möckern, under whom the first number of the sixty-second volume has recently been issued. Dr. Kellner's name will be an assurance to all readers that the high standard established by this journal will be maintained.

Rothamsted Experiment Station.—According to the report of the Lawes Agricultural Trust for the past year, the trust committee continues to find its income very inadequate to the proper development of the Rothamsted Station. "Only donations and subscriptions from various sources, including £300 from the Goldsmiths' Company, £50 from the Clothworkers' Company, £50 from Lord Rothschild, etc., have prevented a serious deficit on the year's working." The report mentions that Mr. J. F. Mason has volunteered to erect and equip a new laboratory for agricultural bacteriology, which will be the first of its kind in that country, as a continuance of the experiments carried on for many years by his father, the late James Mason, at

Eynsham Hall, Oxon. Reference to Mr. Mason's experiments was made in a previous issue (E. S. R., 16, p. 837).

Prize Competition.—In a note in *Nature*, quoted from the *Chemist and Druggist*, it is announced that Dr. Henri de Rothschild has recently offered two prizes for competition, which will be awarded next year. The first one is a prize of $1,000 for the best work on the subject of the best alimentary rations of a child from its birth until the age of 2 years. The second one is a prize of $600 for the best study on the supply of milk to a large city (hygiene, technology, transport, legislation, sale, etc.). These prizes may be divided should the jury of award consider it advisable. The competition is open to foreigners, and papers should be sent in before June 1, 1906. The secretary is M. C. Nourry, 49 rue des Saints-Peres, Paris.

Miscellaneous.—The governor of the island of Guam has established an experiment station to develop and improve the agricultural resources of the island. Hermann L. W. Costenoble has been placed in charge as superintendent.

The Russian Ministry of Agriculture and Imperial Domains was abolished May 19, and was transformed by an imperial ukase into the Administration of Land Improvements and Agriculture. A. S. Yermolov, who had been at the head of the Ministry of Agriculture and Imperial Domains for 12 years, was appointed a member of the imperial council.

The date fixed upon for the annual convention of the Association of American Agricultural Colleges and Experiment Stations is November 14. As previously announced, the meeting will be held in this city.

At the annual meeting of the Herefordshire Education Committee, the agricultural subcommittee reported the receipt of a memorandum from the Bishop of Hereford urging the desirability of establishing at Hereford a well-equipped and efficient agricultural institute, with courses of instruction especially adapted to meet the practical needs of the county. The scheme was highly favored by the agricultural members of the committee, and will be given every consideration by the general committee.

W. H. Beal, of this Office, is spending the summer in travel in Europe. He will visit a large number of the institutions for agricultural education and research, and will attend the sessions of the international congresses on agricultural education and on agricultural engineering at Liege, Belgium.

H. E. Barnhard, chemist to the New Hampshire State Board of Health, has resigned to accept the position of chemist to the new Indiana Laboratory of Hygiene at Indianapolis. C. D. Howard, associate chemist of the West Virginia Station, has been appointed his successor in New Hampshire.

Dr. Julius Nessler, agricultural chemist of Karlsruhe, has died at the age of 77 years.

Dr. Albert Hilger, professor of applied chemistry in the University of Munich, and since 1878 editor of *Jahresbericht der Agriculturchemie*, died May 18 at the age of 66 years.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after the entry, refer to the publications of the respective experiment stations; "P. R." to the experiment station in Porto Rico; "Can." to the experiment stations in Canada, and "U. S. D. A." to those of this Department.

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